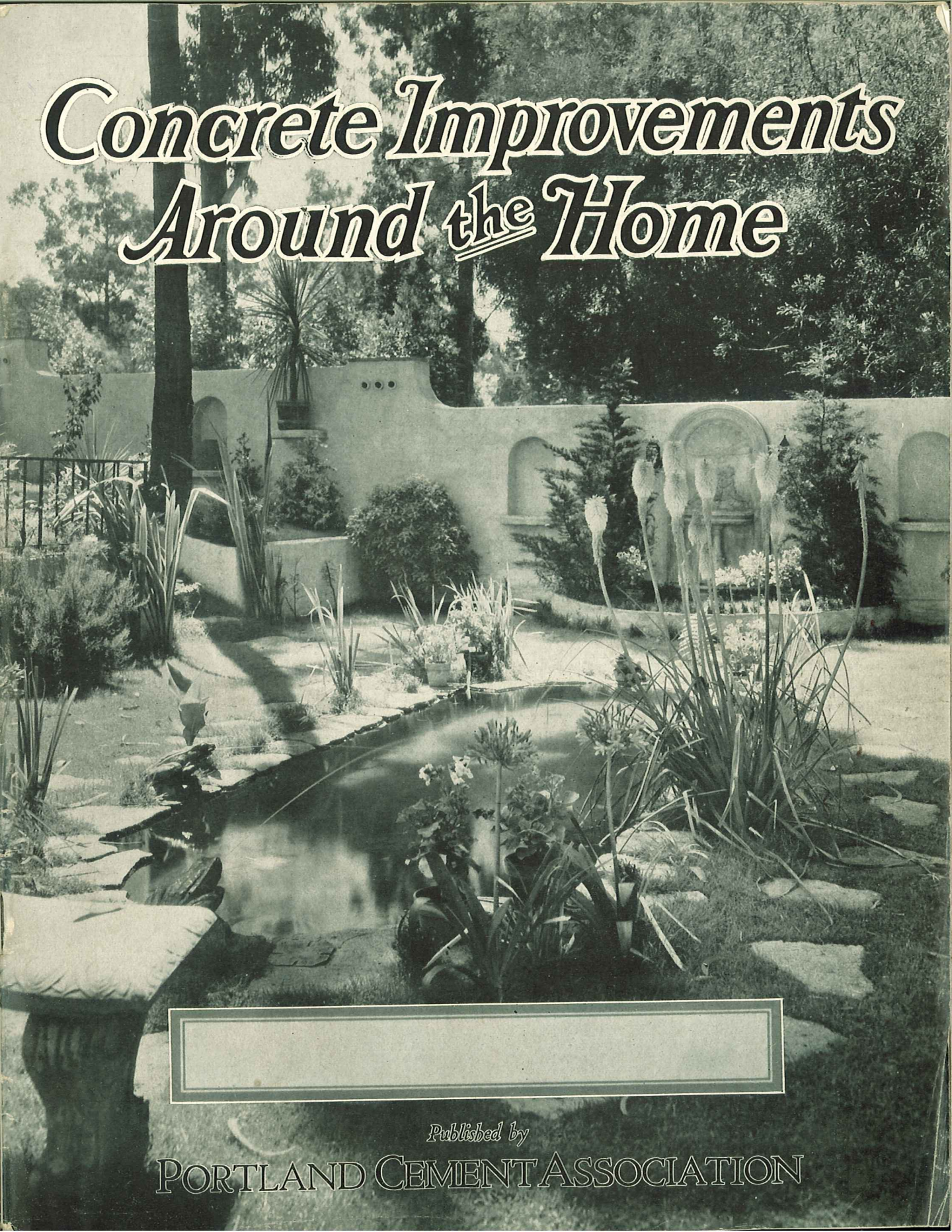
Concrete Improvements Around the Home



Published by

PORTLAND CEMENT ASSOCIATION

TABLE OF CONTENTS

Concrete Improvements Around the Home

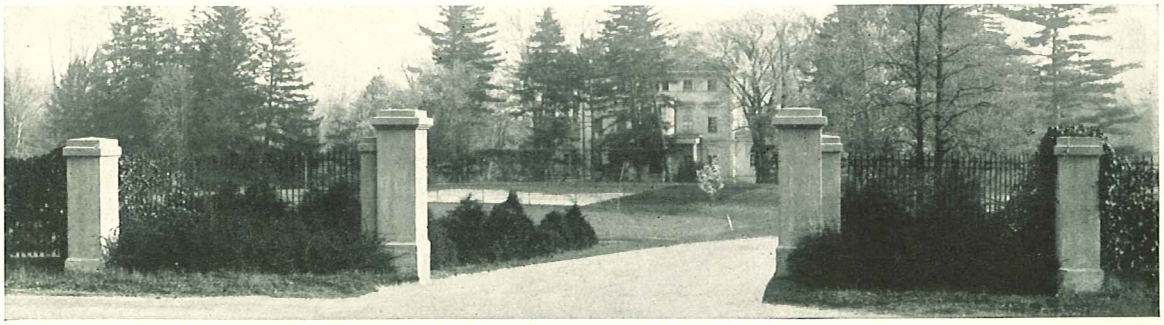
▲

AROUND the home in town or country, concrete finds a wide range of usefulness for making improvements that enhance the beauty and increase the utility and value of the property. It matters not how modest the home or limited the space in lawn or garden, concrete can usually find practical application.

The more strictly utilitarian uses of concrete include walks, drives, retaining walls, steps, porch floors, well covers, cisterns and similar work. Such uses are essential appointments for the modern home. Then there are numerous ways in which concrete may be employed to give a decorative touch to the home and its surroundings. In this group are lawn benches, bird baths, sun dials, flagstone walks, lily pools, flower beds, flower boxes, arbors, and garden walls. There is practically no end of concrete improvements which will increase the utility as well as the beauty of the home.

Along with their advantages of permanence and beauty, improvements made with concrete are decidedly economical in first cost. And when built, concrete improvements last since concrete is a material which is durable, rotproof, fireproof and maintenance-free.

▲

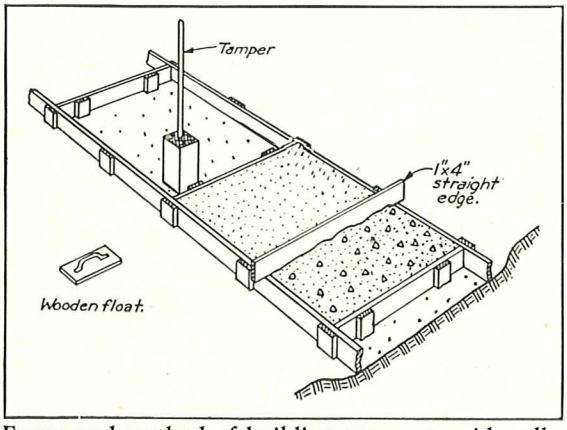


DURABLE SIDEWALKS

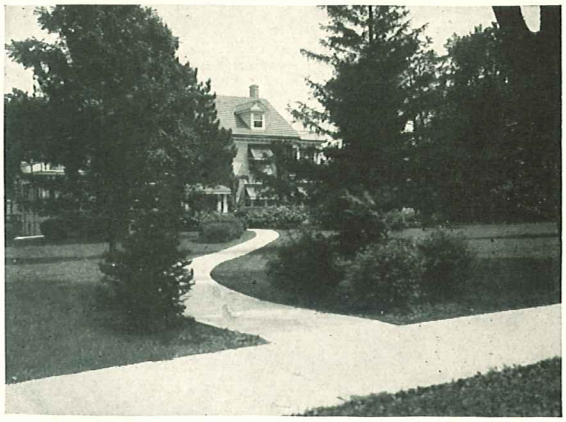
SIDEWALKS are among the most useful improvements which can be built around the home. Concrete is now accepted as the ideal sidewalk material. When properly built, concrete walks meet all the requirements of a good footway. They are durable, smooth without being slippery, easy to clean and are pleasing to the eye. The appearance of the home grounds can be greatly enhanced by building the walks in graceful curves around trees and shrubbery. Colored concrete walks are also attractive.

The first step in the construction of the walk is to prepare the base. If the soil on which it is to be laid is well drained, the concrete can be placed directly on it, after it has been well compacted. If the soil is not well drained a six-inch sub-base of well compacted, clean, coarse gravel, or clean cinders should be provided.

Thickness of walks varies from four to six inches. If used only as a walk, four inches is usually thick enough, but if heavy vehicles are likely to be driven over the concrete the thickness should be six inches. The width to make the walk will vary with its location and its use. Main pathways from the street to the house entrance should be rather wide; four to five feet is a good width. Walks on the side or rear of the house leading to the garage and other buildings or through the garden are usually made from one and one-half to three feet wide.



Forms and method of building one-course sidewalk.



The graceful curve of this sidewalk adds much to the beauty of the lawn.

Usually 2 by 4's are used for side forms, these being held in place by stakes driven along the outside. The top edges of the 2 by 4's are so placed that they serve as guides in leveling off the concrete. It is considered good practice to build walks about two inches above the surrounding grade so that they will be well drained. In building a four-inch walk, therefore, the area that is to be concreted will have to be excavated to a depth of two inches plus the thickness of the fill. To make sure that water will drain off, the walk should be sloped toward one side; a pitch of from ¼ to ½ inch is satisfactory for a walk three feet wide.

Walks are best built in one-course construction which means that the full thickness of the concrete is placed at one time, using the same mixture throughout. For convenience in building and to provide for expansion and contraction joints, walks should be divided at four to six-foot intervals, with partition strips placed at right angles to the side forms. Every other section is then concreted. After these have hardened enough to be self-sustaining, the cross strips are removed and the remaining slabs placed.

Another method which has some advantages in that it permits the walk to be built

continuously, is to place strips of tarred felt against the division or header boards. When the header boards are removed these strips, which extend entirely across the walk and for its full depth, remain permanently in position providing a definite joint between sections. In building walks by this method, concrete is placed on both sides of the header boards before it is lifted out. Then the pressure of concrete from both sides holds the tarred felt vertically, as it should be.

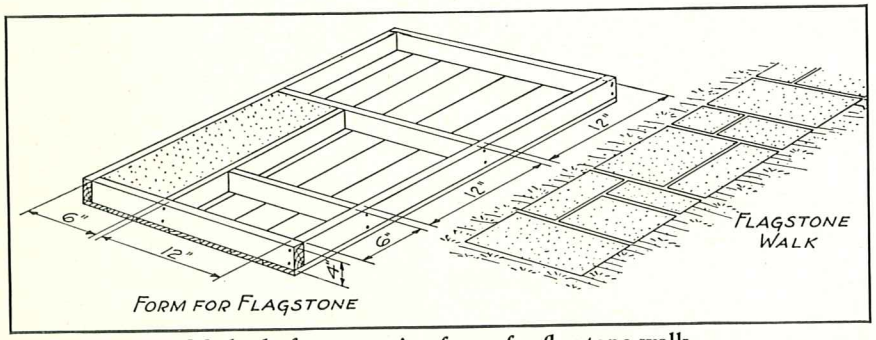
The proper mixture of concrete to be used for making sidewalks will be found in the table on page 43. Also read the instructions for proportioning, placing and curing on pages 43 to 46. The concrete mixture when of the right plasticity is easily leveled off by a strikeboard resting on the edges of the 2 by 4 side forms. This strikeboard is passed across the forms in a saw-like motion, thus leveling the concrete, filling the hollows, and at the same time assisting to compact the concrete. The walk is finished with a wood float to produce an even, gritty surface, and is done several hours after concrete is placed. At this time it will have become quite stiff, but is still workable. To assist the concrete in curing properly a covering of moist sand or earth, about two inches thick, is put on the concrete as soon as it has become sufficiently hard to resist marring, and is kept moist for about ten days. At the end of this time the covering may be removed and walk put into use.

Flagstone Walks

In the garden it is often desirable to construct a flagstone type or a stepping-stone type of walk. Either treatment adds greatly to the charm of the surroundings and may be easily executed in concrete.

Flagstone or stepping-stone walks of concrete add greatly to the charm of the home.

Simple forms for making flagstones of concrete are shown on this page. The various sizes of stone may be placed in any one of a number of interesting designs, one of which is shown. The forms will have to be used several times and they should be assembled so that they may be taken apart easily. Oil them well before concreting. The same mixture of concrete and method of placing and curing, as described for the ordinary sidewalk may be followed. In making stepping stones of concrete, irregular shaped holes may be dug in the ground in the position in which the stones are to lie. The concrete is then placed into these forms and smoothed off and allowed to cure as recommended. Mineral pigments are often introduced into the mixture to produce stepping stones or flagstones of different shades.



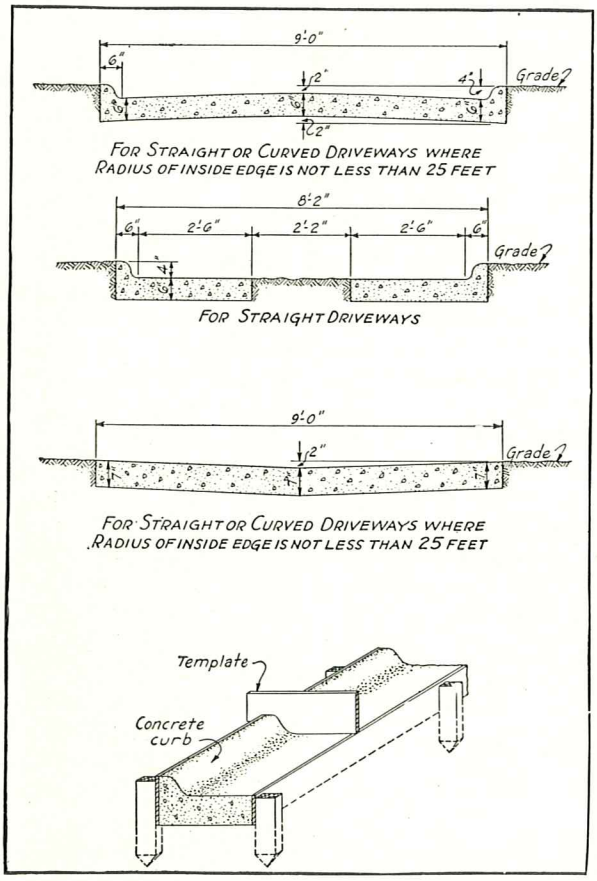
Method of constructing forms for flagstone walk.

YEAR ROUND DRIVEWAYS

AN attractive concrete driveway adds much to the appearance of the grounds, creates a good impression on visitors, and provides a year round passage to the street or highway.

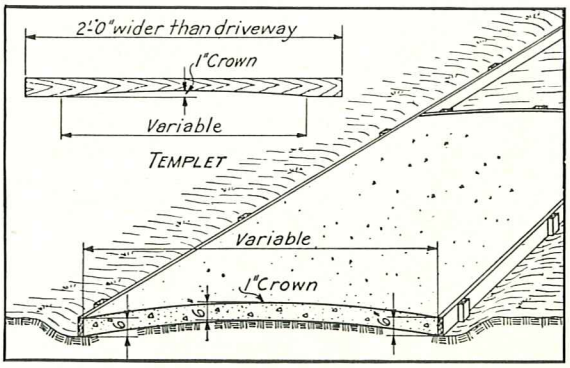
Several types of drives have been developed—the choice of which to build is largely dependent upon how it is to be used. Where subjected to hard service, pavements covering the entire drive area give best satisfaction. Narrow, parallel strips of concrete often provide satisfactory approach where the drive is subjected only to occasional use. However, this type of driveway should be built with curbs on the outer edges. This protects the lawn from carelessly driven vehicles. Plans for both types of drives are presented.

A concrete driveway provides year round passage to the street or highway.



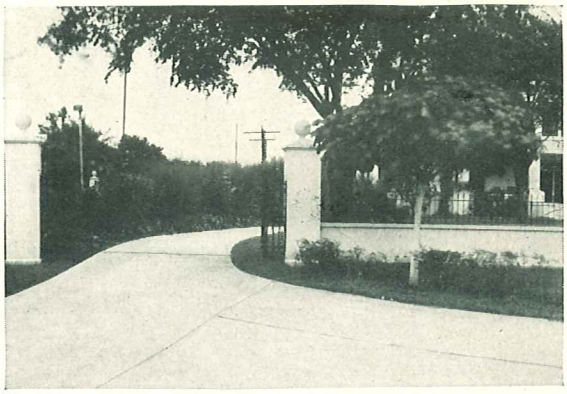
Designs for several types of concrete driveways.

The pavement type of driveway is usually made from 8 to 10 feet wide. A six-inch slab is recommended in order to take care of coal and other delivery trucks. The center of the driveway should be given a one-inch crown to insure drainage. The crown is produced by means of a curved strike-board or template which shapes the surface so that the center is one inch higher than the edges. The base also is shaped with the center one inch higher than the outer edges so that the finished pavement will have a uniform thickness of six inches. Care should be taken to see that the area upon which the pavement is to lay is brought to grade and well compacted before concreting.



Method of constructing pavement type of driveway with crown.

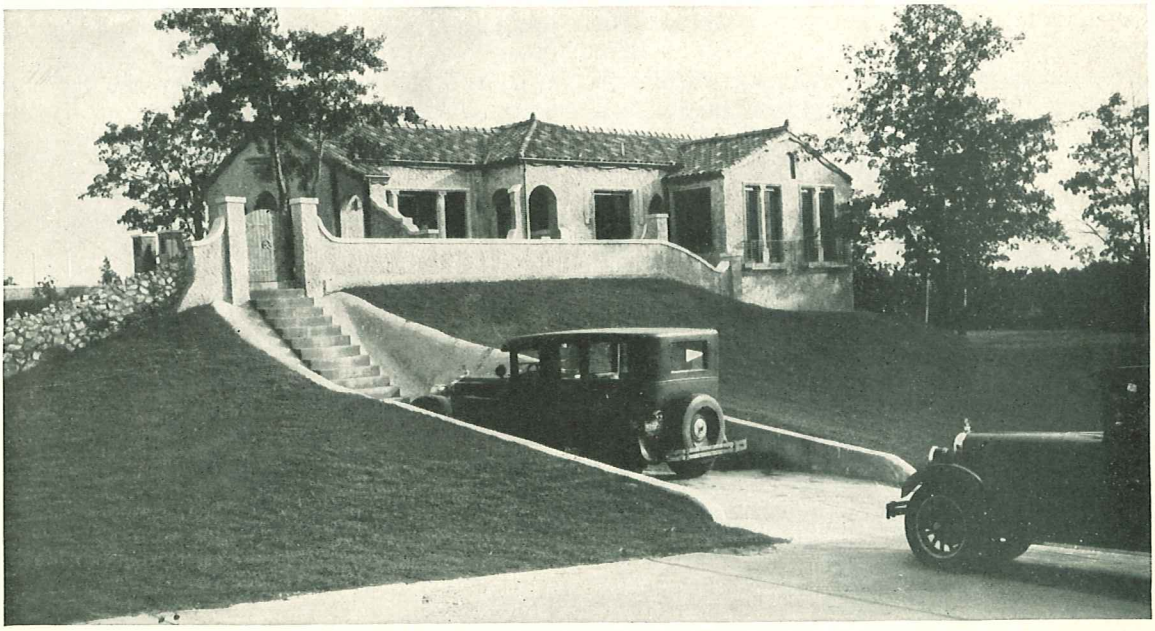
Where the drive is used only occasionally, parallel strips of concrete provide satisfactory approach.



An attractive entranceway adds much to the appearance of the grounds and creates a good impression on visitors.

Use 2 by 6's or 2 by 8's for side forms of the driveways and set cross pieces at right angles to the side forms every 20 or 30 feet to provide expansion and contraction joints. The alternate section method of construction may be used or the driveway may be built continuously as described in sidewalk construction on page 4. One-course construction is recommended using the same mixture of concrete throughout. Methods of placing and curing are the same as for sidewalk construction. See pages 4 and 5.

Finishing should be done with a wood float a few hours after placing concrete, when it is stiff but still workable. An old canvas or rubber belt, 4 to 6 inches wide and 12 feet long will be found very useful in producing a smooth even pavement. The belt is drawn back and forth across the pavement, working slowly forward as the concrete is brought to the desired smoothness.



A unique entrance which combines driveway, retaining wall and steps. The residence and garden wall are constructed of concrete masonry units, finished with portland cement stucco.

Concrete porches and steps are everlasting improvements around the home. They are rotproof and maintenance-free. The concrete steps with side walls at the right have been given an attractive granite finish.

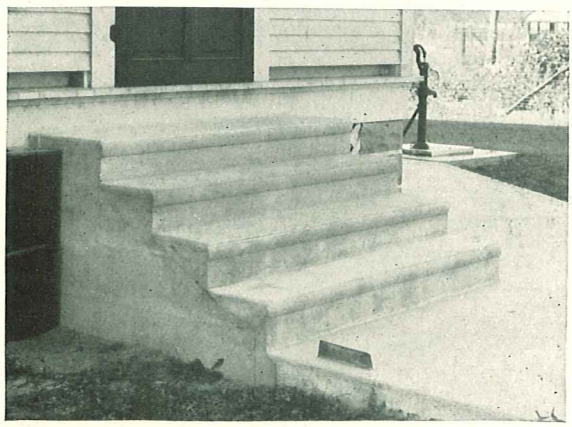
PERMANENT STEPS AND PORCH FLOORS

HOW often we see an otherwise attractive home with the wooden porch and the outside flight of wooden steps badly worn, decayed or sagging away from the structure. Such steps and floors are a constant source of danger as well as being a continuous bother and expense to the homeowner. This is needlessly so for it is just as economical to have attractive, permanent concrete porches and steps as it is to provide other worthwhile improvements around the home.

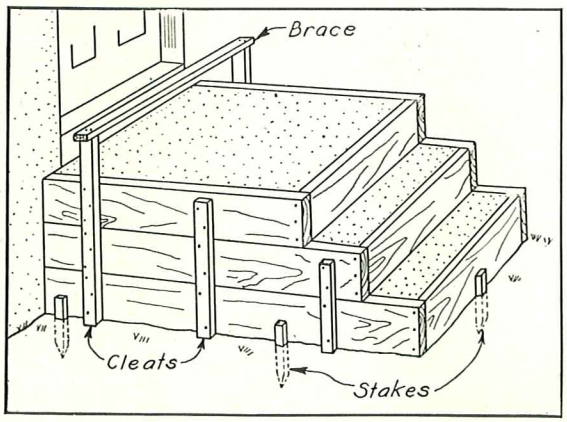
Concrete porches and steps are safe, non-slippery in wet weather and last indefinitely. They are easy to keep clean, and will not rot, burn or require maintenance expense.

Forms for building concrete steps are shown on this page. For a comfortable flight of steps the vertical distance from one step to the next should not exceed 7½ inches, the width of tread should be about 10 inches. Either one-inch or two-inch lumber may be used for forms. The standard mixture for this type of construction is given in the table on page 43. The concrete should be of rather stiff consistency and should contain sufficient mortar to produce a smooth, even surface. Finishing with a wood float produces a smooth yet gritty surface. Cure as recommended.

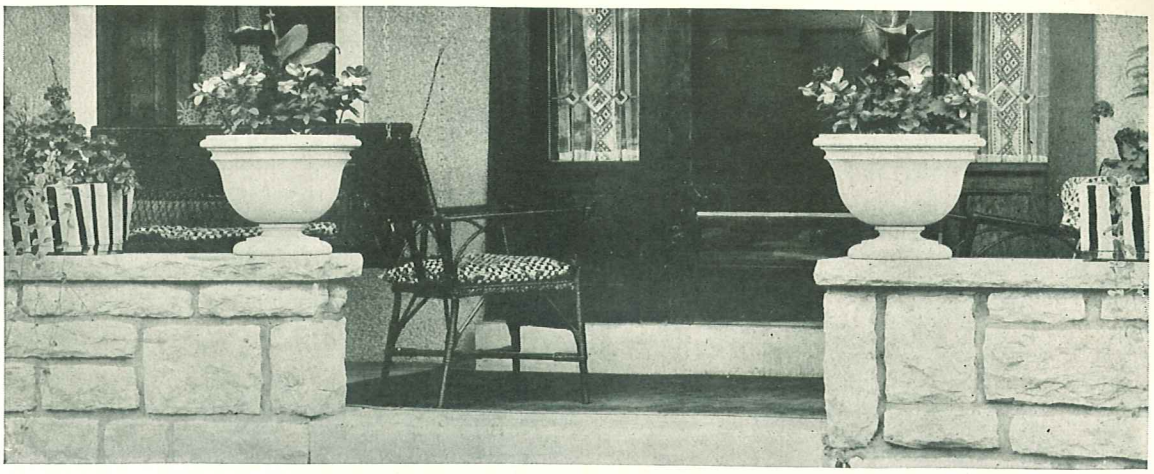
When steps are built with sidewalls, the latter are placed first and allowed to harden.



Concrete steps are safe, non-slippery in wet weather and easy to keep clean.



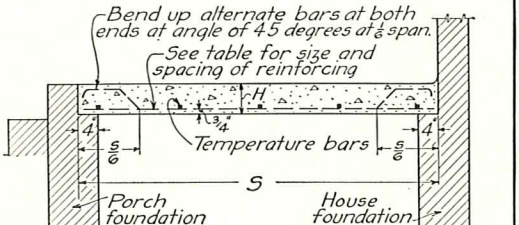
Simple forms for building concrete steps.



Concrete flower pots are permanent, attractive porch ornaments.

The steps are then placed and if resting on well compacted ground will need no reinforcement. Forms consist of planks held firmly in place by means of 1 by 4-inch braces against the sidewalls. To the planks are nailed 1 by 4's for holding the riser forms in place. These supports are of such length that they come within two inches of the treads. Cross pieces, usually of one-inch material, and eight inches wide are nailed to these to make riser forms.

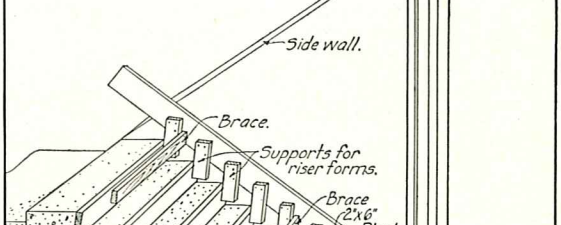
In building porch floors or terraces of concrete the same principles of construction apply as for sidewalk construction. A well compacted sub-base is essential. If the ground upon which the porch floor or terrace is to rest is well drained the concrete may be placed directly on it, if not, a sub-base of clean, coarse gravel or cinders should be provided. They are usually made from four to six inches thick. Where the porch floor rests on a firm fill, it will need no reinforcement, but if over an excavation or part of the basement it will need reinforcement in both directions as shown in the drawing on this page. The recommended concrete mixture for porch floors is given in the table on page 43. Finish with a wood float to secure a smooth, yet gritty surface and cure as recommended. Porch floors are given a slope of ¼-inch to the foot, to insure drainage.



TABLE

S	H	Size of rods	Spacing of rods
4'-0"	4½"	¼"	8"
5'-0"	4½"	¼"	6"
6'-0"	4½"	⅜"	9"
8'-0"	5"	⅜"	6"
10'-0"	5"	⅜"	4"

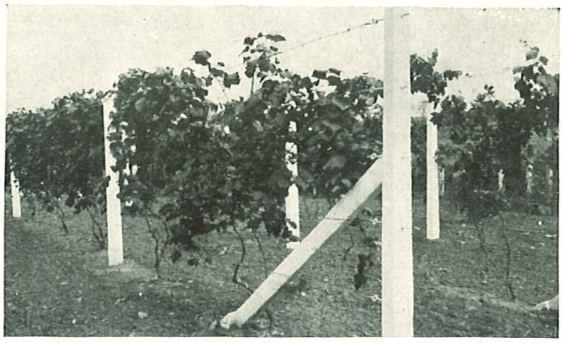
Method of constructing reinforced concrete porch floor.



Forms for basement steps.

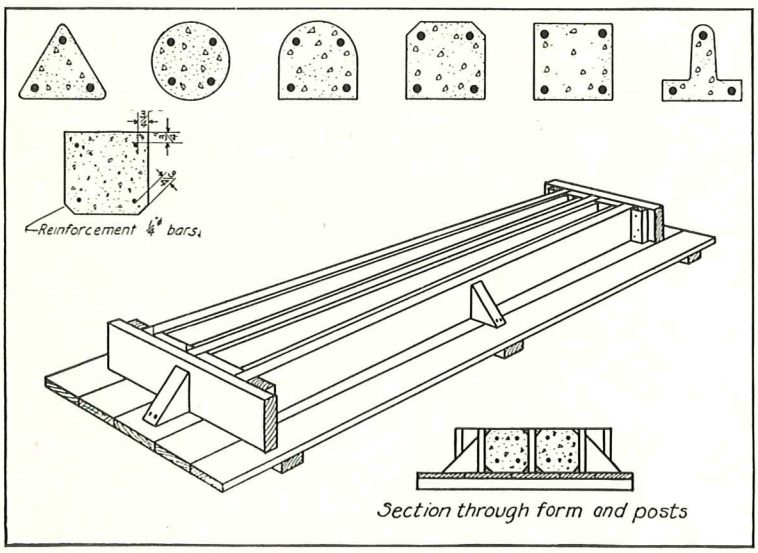
ROT-PROOF CONCRETE POSTS

CONCRETE fence posts, grape arbor posts, mail-box standards, clothesline posts and ornamental gate posts are permanent home improvements that greatly enhance the value of the property. Concrete posts are maintenance-free. They do not rot or burn and are not injured by borers or fungus growths. They require no replacement as in the case of posts that decay. Many concrete products plants carry stocks of good quality concrete posts and if it is impossible to build posts or have them built, it may be possible to purchase them from a manufacturer.



Concrete posts provide durable, rotproof supports for heavily laden grape vines.

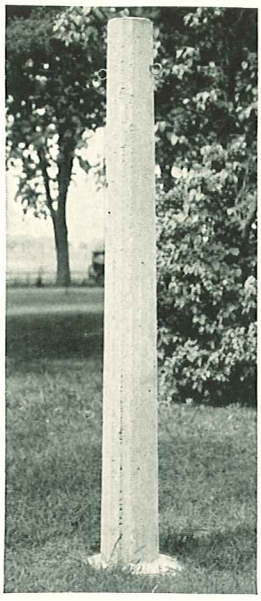
Grapevine posts, clothesline supports, mail-box standards and fence posts are made in practically the same manner, the main difference being in their size and shape. Cross-sectional views of several practical post designs are shown on this page. The triangular, round, half round and T-shaped types are usually made in metal molds. There are a number of good metal molds on the market. While posts made in metal molds will have truer shapes and smoother surfaces than those cast in wooden forms, the latter will give satisfactory results if care is taken in constructing the forms. A simple design for a two-post mold is shown on this page. This may be varied in size and shape to make fence posts, clothesline supports, etc. Seven feet is a good length for fence posts, allowing them to be set two or two and one-half feet in the ground. The lumber used in constructing the forms should be sound, straight-grained and smooth on all sides that will come in contact with the concrete. Two-inch material is used for the sides and end pieces and for the divider. Triangular strips are tacked to the sides and divider to give the posts a neat appearance on the edges. Forms should be soaked with oil to prevent the boards from warping and the concrete from sticking.



Several practical post designs and a simple two-post mold for making the rectangular type.

One-quarter-inch round or square rods make good reinforcement for concrete posts and should be placed as shown by the black dots in the cross-section on this page. The rods are located near each corner and about three-fourths of an inch from the surface.

The table on page 43 shows the proper mixture of concrete for concrete posts. The thoroughly mixed concrete is placed about one-inch deep in the form, then two reinforcing

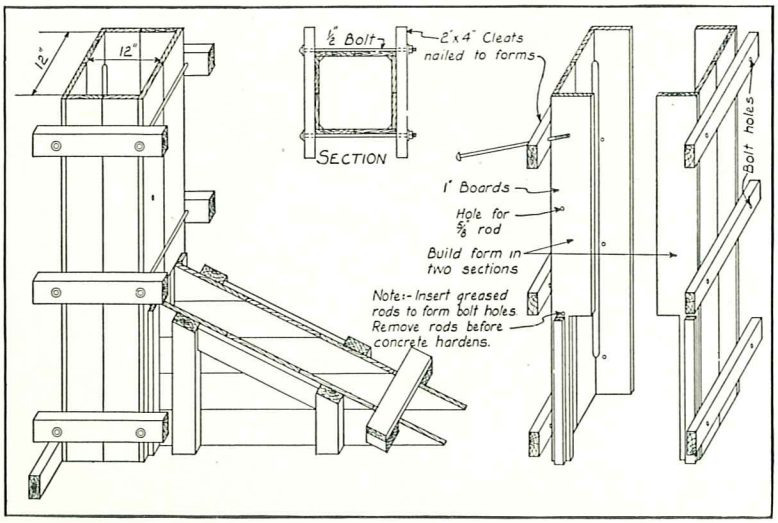


A permanent clothesline post of concrete.

These massive concrete entrance posts provide permanent support for the gate and enhance the beauty of the grounds.

rods are placed one in each corner three-fourths of an inch from the side and bottom. Fill the form then to within three-fourths of an inch of the top and place the other two reinforcing rods. Fill the form to the top, smooth off and trowel. As concrete is placed, it should be compacted by tapping the form and by running the trowel along the sides and up and down in the concrete thus removing air bubbles and producing posts with smooth surfaces. Care must be taken not to displace the reinforcement.

The forms should remain undisturbed until the concrete has hardened sufficiently to permit removing posts without damaging them. Twenty-four hours is usually sufficient in summer, but in cold weather more time is required.



Forms for corner, end or gate posts cast in place.

In summer, the posts should be placed in a shady place and wetted at least twice daily for about ten days. If shade is not available, a covering of sand or straw kept moist by sprinkling is satisfactory. Do not set posts until they have cured at least 28 days; a two or three months curing period is even better.

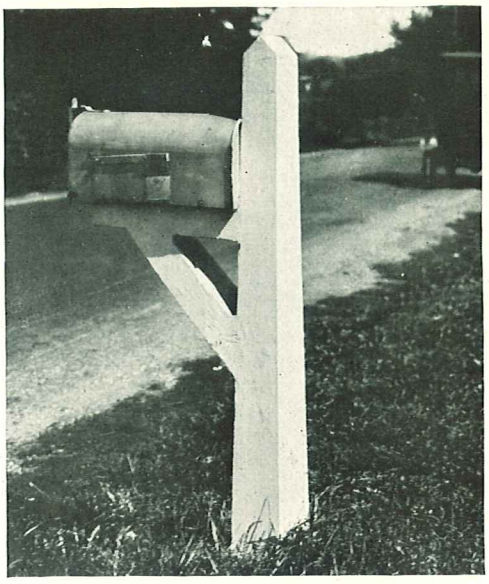
Corner, Gate and Entrance Posts

Concrete posts at the end of fence lines are subjected to heavy pulls and therefore it is necessary that they be

made larger and reinforced more heavily than ordinary fence posts. Gate posts sustain the load of the gate and must likewise be large, while entrance posts are usually made massive to make them impressive in appearance.

It is sometimes necessary to provide concrete braces to keep corner and gate posts in proper position.

On account of their size and weight large posts are usually built in place. Excavate carefully to a depth of not less than three feet so that the earth may serve as forms for the part of the post below grade. Fill the excavation with concrete using a mixture as recommended in the table on page 43. Care should be taken to place reinforcing rods so they will extend from the top of the posts to a point at least two feet below the ground.



This concrete mail-box standard will last indefinitely.

Forms for casting the above grade portions of the posts are next placed, and the concreting completed. If braces are cast with the posts, the rods reinforcing them should extend well into the main post. When building corner or gate posts, bolts and fittings necessary to attach wires or to receive the gate should be well embedded in the concrete. The concrete post may be finished in a number of different ways, several of which are described on page 40.

Concrete masonry units are often used in constructing the heavier types of posts. The posts can be securely reinforced and made practically monolithic by inserting rods in the core spaces of the block or tile, and filling them with a rich mixture of concrete. Concrete masonry posts are often surfaced with portland cement stucco.

Concrete fence posts do not rot or burn; they are permanent home improvements.

An ornamental garden wall adds to the beauty of the grounds and gives a sense of privacy.

GARDEN WALLS AND RETAINING WALLS

ORNAMENTAL walls enclosing the garden or the entire grounds are becoming increasingly popular because they add to the beauty of the grounds as well as give a sense of privacy. Retaining walls to hold embankments or terraces in place are also useful home improvements which may be made attractive. Regardless of the type of wall, concrete is the ideal construction material because of its permanence, economy and the variety of surface treatments that it permits.

Walls may be built either monolithically or of concrete block or tile. In either case the wall should be carried down to solid footing and in severe climates below the frost line. The advantages of using concrete masonry units is in their ease of assembly—no forms being necessary. Units may be obtained from a local concrete products manufacturer.

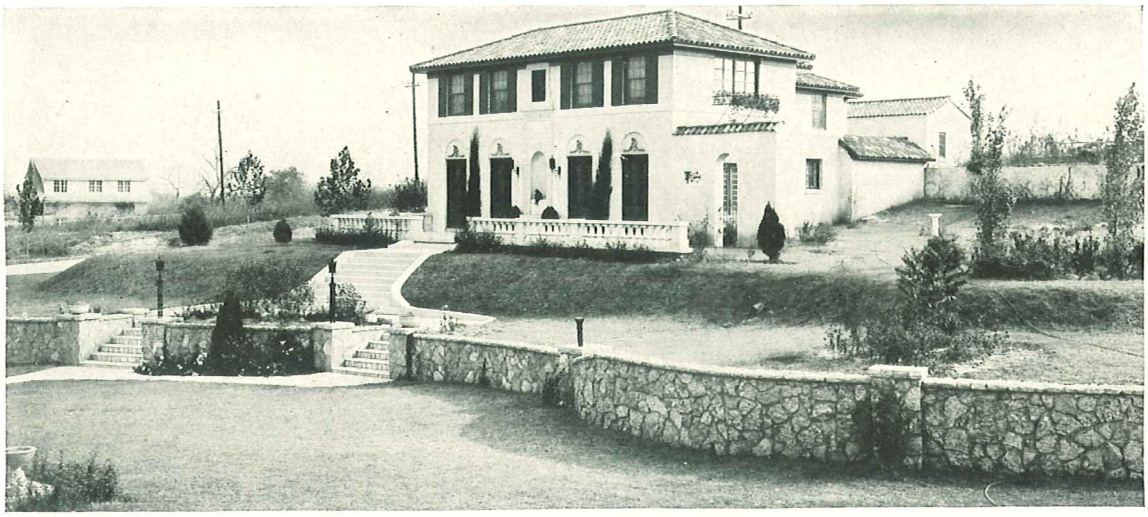
When the garden wall is to be simply an enclosure it requires but little strength beyond that necessary to make it self-supporting. If, however, the wall is to be used to hold an embankment in place, special construction is necessary to give it added weight and stability. Where embankments are not more than 3 feet high this may be accomplished by filling the cores with a rich concrete mixture in which reinforcing rods are inserted. Where embankments exceed three feet in height some provision should be made for bracing the wall with pilasters at regular intervals or for securing suitable anchorage in the earth embankment.

A 1-3 mortar (one sack of cement to three cubic feet of sand) to which is added 10 pounds of lime is recommended for laying up a concrete masonry wall. The mortar should be mixed thoroughly with just enough water to give plasticity and workability, as described on page 44. Care should be taken to see that each unit is well embedded in mortar and that the joints are filled and pointed.

A surfacing of portland cement stucco may be applied to the wall if desired. Textures and colors may be chosen to harmonize with the home and surroundings. A garden wall with stucco of a well selected texture and color forms a perfect background for flowers and shrubbery.

Another very popular type of masonry wall treatment is to apply only a brush coat of cement wash to the wall so that the masonry character is retained and joint markings remain faintly visible. When coloring is desired mineral pigments which are usually obtainable from local building material dealers may be incorporated in the wash coat or acid stains developed especially for coloring concrete surfaces can be applied to the finished wall.

Masonry units are sometimes laid up in a careless random fashion with varying numbers of units protruding slightly from the face of the wall thus effecting an ap-



The attractive design of this retaining wall is in pleasing harmony with the surroundings. The residence is built of concrete masonry and portland cement stucco.

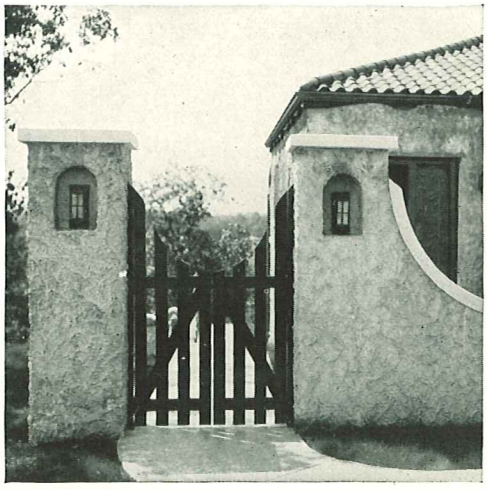
pearance of ruggedness. The use of more mortar than is actually necessary, commonly called protruding mortar joints, is also employed to create a rough textured finish.

In constructing monolithic walls forms similar to those shown in the drawing on page 15 may be used. They should be rigid and well braced in order to withstand the pressure of the wet concrete and produce a straight, even wall without bulges or depressions. For keeping inside form surfaces the proper distance apart, inner and outer sections should be clamped or wired together against wooden spacers or spreaders of a length equal to the desired wall thickness. The spreaders are removed as the forms are filled with concrete. If the earth is firm the sides of the excavation will serve as forms for the wall below grade; if not, forms must be carried to the bottom of the excavation.

When building a retaining wall, if the earth embankment is solid and well compacted it will serve as one side of the form.

Where the retaining wall must support a considerable load, a gravity wall will be found satisfactory. It is called a gravity wall because its weight is sufficient to keep it from leaning or turning over as a result of earth pressure on one side. A wall of this type requires no steel reinforcement. The width of the base is made equal to one-half its height. The top of the wall should be at least 6 inches thick regardless of its height.

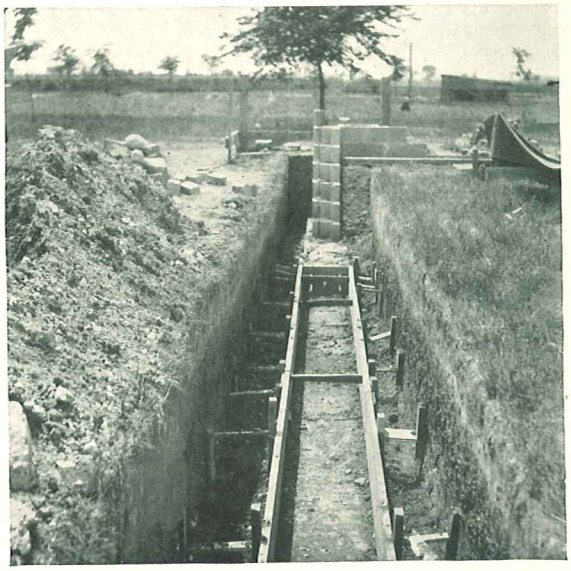
The recommended mixture for monolithic walls is given in the table, page 43. Also read the directions for proportioning, mixing and placing. The concrete should be placed in the forms in layers of from 6 to 10 inches deep and in a continuous operation if possible to avoid construction seams. The concrete should be well spaded next to form faces so as to obtain smooth, even surfaces.



A combination of concrete masonry and portland cement stucco has given unique charm to this gateway.

FOUNDATION WALLS

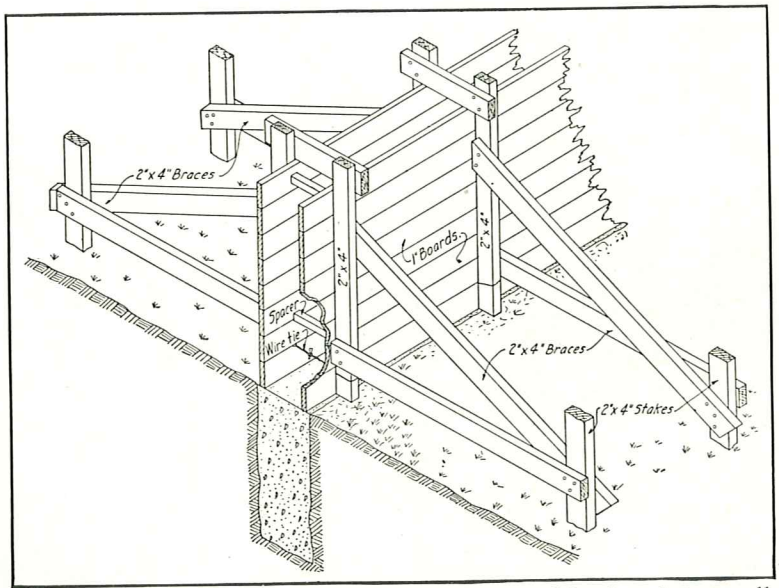
FOUNDATION walls either monolithic or of concrete masonry, below grade or above grade, are constructed in much the same manner as has been described. Their thickness varies with the load to be carried; for small structures walls 6 to 8 inches thick are sufficient. It is essential that all foundation walls extend below possible frost penetration even though firm bearing soil is found at a shallower depth. Foundation walls are usually built on footings to distribute the load over a greater area thus reducing the possibility of settlement. Some soils will carry heavier loads than others so the width of the footing is varied according to soil conditions and the weights to be sustained. Footings 12 inches wide and 8 inches thick are sufficient for small buildings.



Form for concrete footing in place.

In building monolithic foundations for small structures without basement the earth walls of the foundation trench may be firm enough to eliminate the need of specially built forms for the part of the wall below grade. The trench, however, should be excavated carefully so that the sides will be even and vertical and care should be taken not to knock loose dirt into the trench when depositing concrete.

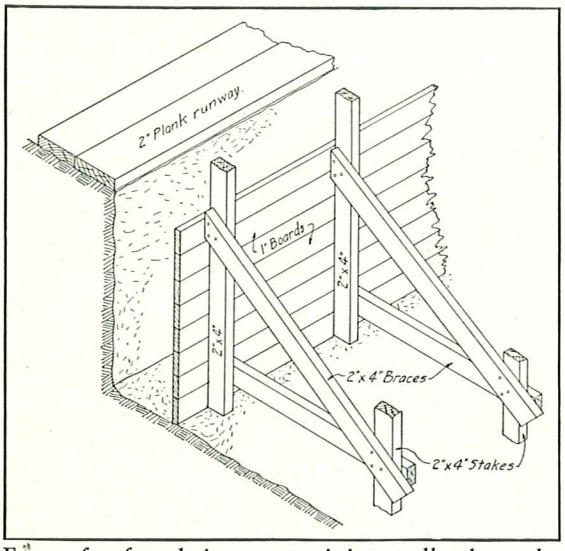
In soft caving grounds, and for walls above grade, forms will be required. These may be constructed in accordance with the drawing on this page. Place the concrete mixed as recommended in the table on page 43 in the forms in layers of from 6 to 10 inches and in a continuous operation to avoid construction seams. Spade well next to the form faces so as to obtain smooth, even surfaces.



Forms for walls above grade. This plan can be used for foundation walls or garden walls.

Termite Control

Wood-boring insects, principally the termite or white ant exact an annual tribute of $45,000,000 from the users of timber in this country, according to Thomas E. Snyder of the U. S. Department of Agriculture. The activity of the termite is centered upon the



Forms for foundation or retaining wall where the earth serves as one side of the form.

wooden portions of buildings eating out the interior parts and greatly weakening the structure. Often the interior of the supports and woodwork may be entirely eaten out but since the termite leaves a protective outer shell the damage is unsuspected until beyond repair.

The termite is less than ½ inch long and lives in the ground, subsisting upon vegetable matter. It shuns the light and will die if exposed to the sunshine for long periods. It does not crawl about in the open like the ordinary ant but remains in an earth-like shelter tube which it builds as it leaves the earth in order to reach woodwork above the ground. The discovery of the tubes on surfaces is one means of detecting the presence of termites.

Extermination is practically impossible and the best method of preventing damage from termites is to keep all untreated wood from contact with the ground where termites find entry. Building them out with high concrete foundations, full basements, concrete steps, porches and floors is one of the best protective measures.

Masonry foundations and footings should be laid up in portland cement mortar and the units, whether hollow or solid, should be capped below the woodwork with concrete. Where poor grades of mortar have been used in masonry walls below grade surfacing them with concrete is advised because termites are able to penetrate some mortars after a period of years. Porch steps and porch floors around the house are ideal pathways for the insects unless they are built of concrete. Wooden floors should never rest directly on the ground, but there should be a layer of concrete over the entire area between the earth and the wood.

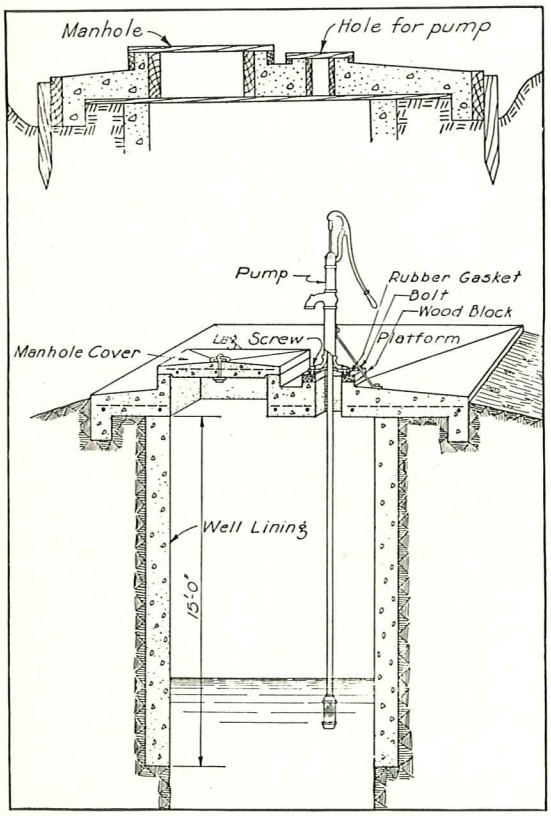
This concrete retaining wall also serves as a walk.

WELL CURBS AND PLATFORMS PROTECT THE WATER SUPPLY

A CONCRETE well curb and platform is recommended by health authorities as a permanent means of insuring spring and well water supplies against contamination. The concrete curb extends high enough to prevent surface water from entering and deep enough to exclude seepage and burrowing animals. The concrete platform or covering completes the protection.

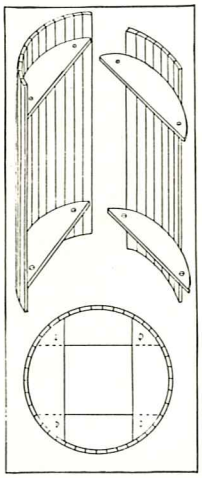
The earth wall of the well is generally sufficient for the outer forms, but if not, the excavation will have to be enlarged to provide room for wooden forms. A convenient collapsible interior form, made of 1-inch materials, is shown in the accompanying drawing. It is made in four sections, the cross pieces being held together by bolts which are removed when the form is taken down. The sheathing boards should not be more than 4 inches wide. Apply oil to form faces next to concrete to make removal easy. For the small well a curb 4 inches thick is sufficient, but for a larger well 6 inches is recommended.

A concrete well curb and platform protects the water supply.



Recommended method of constructing concrete well curb and platform.

For wells and spring enclosures 6 feet or less in diameter a platform 4 inches thick at the edges is adequate. Quarter or ⅜-inch reinforcing rods should be placed 6 inches apart in both directions and located about one inch above the lower surface of the concrete. The platform is most easily built square and should extend well over the edges of the well curb. It should be at least an inch higher at the center than around the edges to insure drainage.



Inside forms for well lining.

A tight board platform braced in position from below or suspended by wires or brackets to the previously placed curb will serve as a bottom form for the cover. Before placing concrete, provide for an 18-inch manhole, also an opening for the pump

stock. Bolts may be set in the concrete for attachment to pump base. A cross-sectional view of the forms for the cover slab with the recommended method of constructing the manhole is shown. The removable cover for the manhole is made separately. Another method of providing a manhole is to set a large dishpan on the platform form, the concrete being placed around it and sloped upwards slightly against the pan. Removal of the pan will provide an opening with sloping edges in the concrete and a tight fitting cover can be made by casting it in the interior of the pan. The drawing of the cistern on page 19 shows this method and although it is much easier to construct, it is not considered as sanitary a cover as the first mentioned.

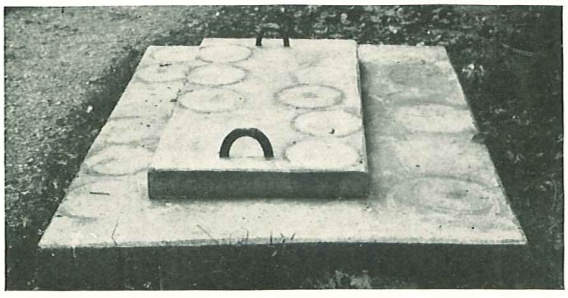
The concrete mixture recommended for curb and platform construction is given in the table, page 43. As the concrete is placed it should be tamped and spaded and any rough spots found on removal of the forms are patched with a 1-2 concrete mortar.

A clean, cool drink of uncontaminated water from a concrete covered well.

Finish the platform with a wood float to secure a smooth, yet gritty surface.

CISTERNS

A SANITARY concrete cistern in which to store soft water for laundry and other household uses is a welcome home improvement. Cisterns are often used to store drinking water where underground water is impure or hard to get. Concrete construction keeps out burrowing rodents, polluted surface water and seepage. Since rain water gathers impurities in passing through the air and over roofs a screen or filter through which the water must pass in entering the cistern is an important sanitary feature.



A sanitary, concrete cistern with removable cover.

Cisterns may be built either round or square and in any size required to meet the needs of the family. The plan accompanying shows a circular cistern having a capacity of 3,420 gallons.

If the soil is firm, the earthen walls of the pit will serve as the outside forms in building a cistern. A convenient interior form may be assembled as shown on page 17 for well curbs. This is made in sections so as to be collapsible and is held together by bolts which are removed when the forms are taken down. Sheathing boards may be of 2-inch material not more than 4 inches wide. A hole should be cut in the form about 18 inches below the surface to allow for the inlet tile. The hole is placed at the joint of two sections of the form (a half-hole in each section) to make removal of the forms easy. The tile should be firmly placed in position before concreting begins. The floor and walls should be placed in one operation, the interior form being supported across the top of the excavation so that it hangs 6 inches (thickness of floor) above

the floor of the pit. This eliminates any joints between the floor and wall which if present might permit leakage. Oil the forms to facilitate their removal. Place reinforcement as shown in the drawing and before concrete is placed. Take care not to displace it when spading and tamping concrete in the forms.

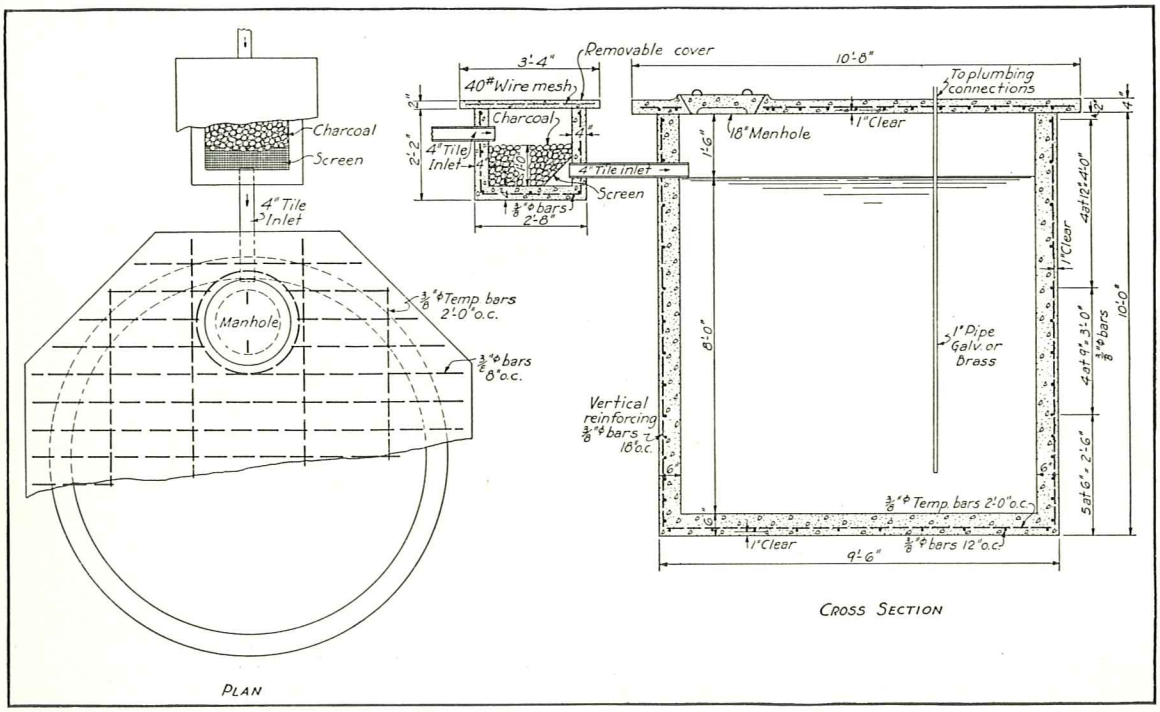
When the concrete has hardened sufficiently to be self-supporting the forms may be removed and any rough spots patched with a 1-2 cement sand mortar. If construction is such that joints occur between floor and walls they are made watertight by filling with hot tar.

A filter for cistern water.

The reinforced cover slab may be built round, square or octagonal and should be 4 inches thick and overlap the walls about 8 inches. A tight board platform should be constructed for the bottom form and can be braced in position by 2 by 4's resting on the floor of the cistern. Provide for a manhole in the cover slab using either type described under well platforms on page 18 and insert proper pipes for attachment of pump or plumbing connections. The bracing can be removed through the manhole when the cover has hardened. Two-inch material will serve for side forms of the cover slab.

Quarter or 3/8-inch reinforcing rods spaced 6 inches apart should be placed in both directions about one inch from the bottom surface of the cover slab. Finish with a wooden float to give a smooth, yet gritty surface.

The recommended concrete mixture for this work is given in the table on page 43. Follow carefully the recommended practice in mixing, placing and curing concrete. Do not use the cistern for two weeks after concrete has been placed.

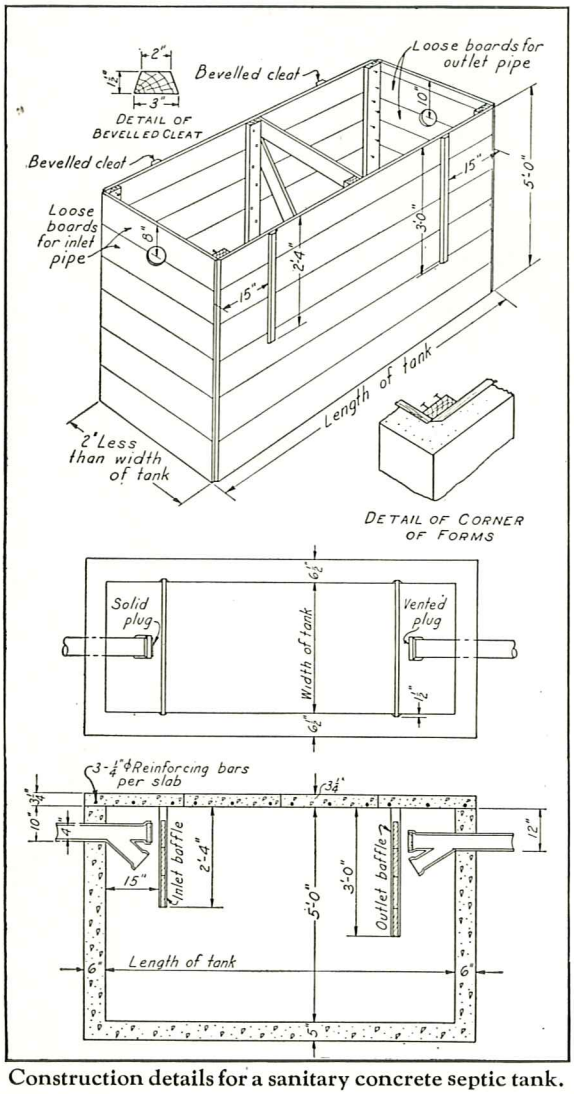


Construction details for building a circular concrete cistern. The filter shown can be built if desired.

A simple filter can be made as shown in the drawing. The construction of this will require only an interior form if the earth does not cave. The walls are made 4 inches thick. Use the same concrete mixture as for the cistern. The cover should be removable to allow access for cleaning and should be tight fitting and overlap the walls slightly. Charcoal makes an excellent filtering material.

SANITARY CONCRETE SEPTIC TANKS

A CONCRETE septic tank is good health insurance. Its development has been a great boon to those who live where sewers are not available for it provides a safe method of disposing of wastes from the modern bathroom and the kitchen sink.



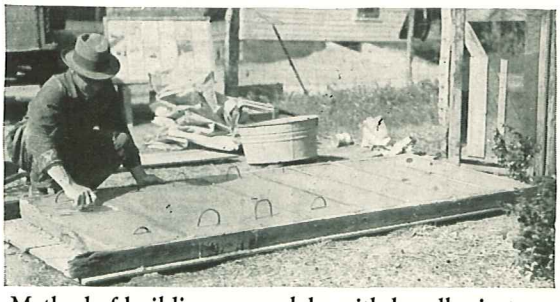
Construction details for a sanitary concrete septic tank.

A septic tank is a watertight concrete receptacle in which the solid particles of sewage are broken up by bacterial action. Part of the solids are converted into gases while a portion called sludge sinks to the bottom. Baffle boards and special inlets and outlets are provided so that incoming sewage will cause the least possible disturbance of the sewage in the tank.

A septic tank should be made large enough to hold a minimum of 50 gallons for every person served. It is seldom advisable, however, to build a tank holding less than 450 gallons even though serving only two or three people.

The liquid flowing out of the septic tank is far from being pure and is given further treatment in what is known as the purification field. This consists of one or more lines of ordinary drain tile laid with open joints into which the sewage is discharged and allowed to seep into the surface soil where bacteria of another sort completes the purification.

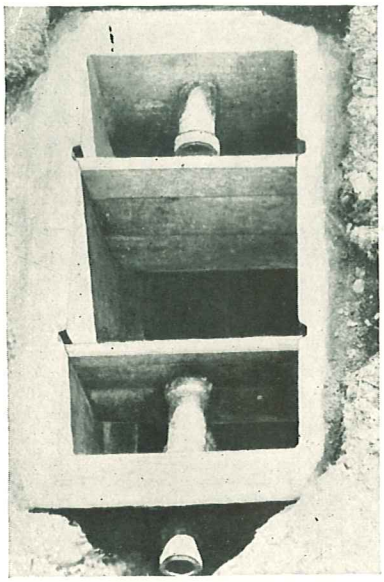
These tile are laid about 12 to 18 inches below the surface of the ground and at a pitch of ½-inch in 10 feet to insure good drainage. Where the soil is light and porous and the ground water level is several feet below the surface, 30 feet of tile per person is sufficient. In tight, clay soils 100 feet of tile per person is often required.



Method of building cover slabs with handles in top.

The sewer lines connecting plumbing systems of the house and septic tank should consist of bell-mouthed sewer tile with tightly cemented joints. Tile carrying sewage should never be laid with open joints in the vicinity of a well or other source of water supply.

A septic tank is usually built in place. An excavation is first made and if the soil is firm and will not cave the earthen walls of the pit may be used for outside forms. In this case the excavation should be made to the exact dimensions of the outside measurements of the tank. Be sure that the sides of the pit are smooth and vertical and the corners square. If the soil caves, both outer and inner forms will be required. Construct the inside forms as shown in the drawing. The beveled cleats on the form are to make grooves for the insertion of baffle boards. Inlet and outlet fittings must be secured in place when concrete is placed.



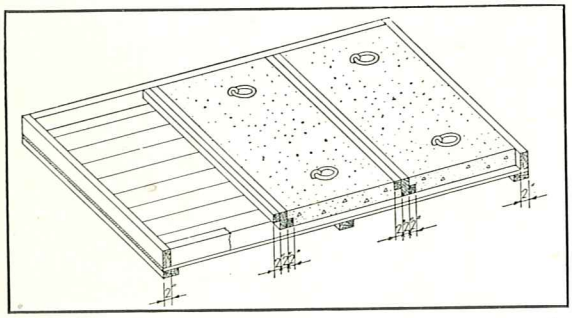
Top view of septic tank with cover slabs removed.

A septic tank must be watertight. Use the recommended mixture for this type of work as shown in the table on page 43. The floor and walls of the septic tank should be placed in one operation so as to eliminate joints. This may be done by supporting the interior form across the top of the excavation so that it hangs 4 inches from the floor of the pit. As soon as the 4-inch floor is placed the concrete for the walls may be deposited. Oil the forms well to facilitate removal. The concrete should be deposited for the side walls in 6 or 8 inch layers, spading and tamping it while placing.

The cover slab is made using the same mixture as for the tank and is reinforced with ¼-inch or ⅜-inch rods. It is usually constructed in several sections as shown in the drawing to facilitate removal. In figuring dimensions and assembling forms be certain to allow for the lap-joints between sections.

In warm weather forms may usually be removed the day following concreting. It is best to take off the forms as early as the concrete will permit; otherwise they may continue to swell, making their removal difficult. The concrete should be allowed to harden for three weeks in warm weather and longer in cold before tank is put into use.

There are a number of good precast concrete septic tanks on the market which when properly installed with an adequate purification field render very satisfactory service. A list of plants manufacturing septic tanks in your locality may be obtained from the Portland Cement Association.



Method of constructing cover slab for septic tank.

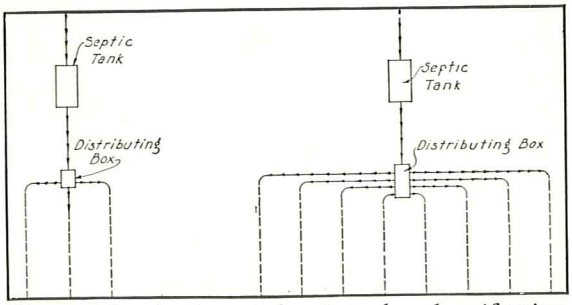
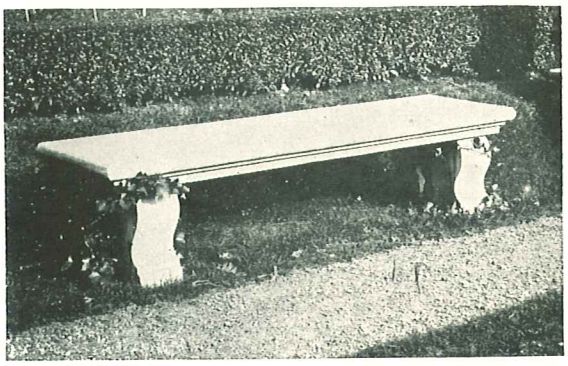


Diagram showing layout of septic tank and purification field.

CONCRETE LAWN BENCHES

LAWN or garden benches are useful and add much to the appearance of the yard. They are commonly placed where they will command a good view of the garden. Very often they are placed on the axis of walks, in niches formed by plantings or by the enclosing garden wall or hedge. A permanent bench may be built of concrete with a minimum expenditure. On the page opposite are shown plans and construction details for a bench of simple design.

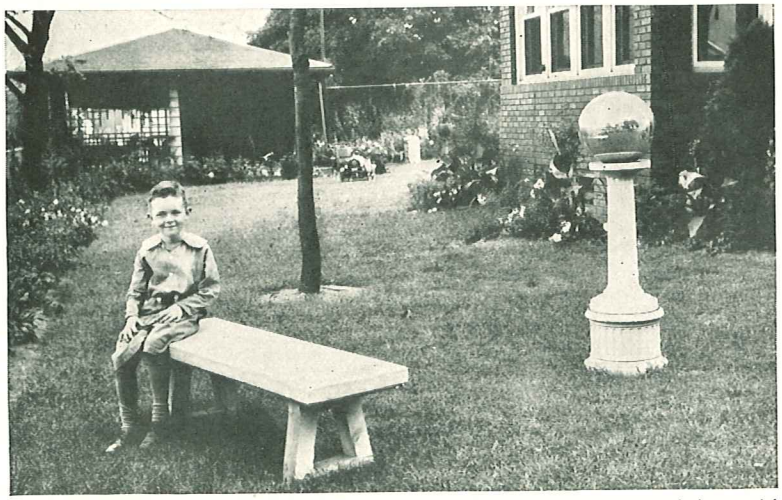
The seat mold is made of one-inch boards planed so that the inner surfaces will be smooth and level. The inner sides of the forms are lined with moulding as shown, so that the edges of the seat will have a finished appearance. Holes are bored in the bottom form boards in which plugs are tightly inserted to provide holes in the concrete for dowels which key the seat to the supports. Reinforcing consists of ¼-inch steel bars placed as shown. Form for use in casting supports is also built of one-inch material with the exception of the curved portions which are made of galvanized sheet metal properly bent and braced to resist the pressure of the concrete. Dowel holes are also provided in the supports and placed as shown. To prevent warping of surfaces both forms should be painted with two coats of varnish or shellac. Before the concrete is placed they should be given a thin coat of light lubricating oil.



A concrete bench is an attractive addition to the lawn or garden.

The proper mixture for this type of work is shown in the table on page 43. Place a layer of concrete one inch deep over the entire bottom of the seat form and tamp thoroughly so that the concrete will be a compact mass, free from air bubbles. See that the concrete mixture is forced against the moulding to form a smooth surface accurately reproducing the lines of the moulding. Reinforcing rods may now be placed in both directions as shown, and the remaining 2½ inches of concrete tamped into the form. In no case should the reinforcing be nearer than one inch to the surface of the concrete. The surface can be leveled with a straightedge or planed board and then lightly troweled to produce a smooth surface.

Concrete for the supports is placed in much the same manner except that no reinforcement is required. A trowel should be run around the mold edges and up and

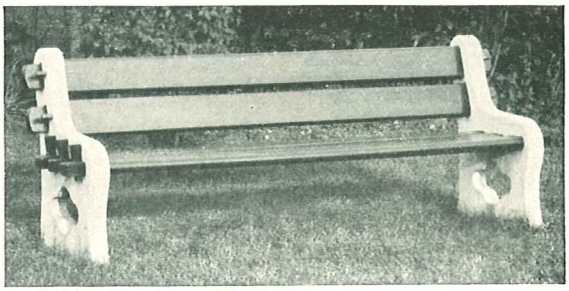


Both the bench and gazing globe pedestal are built of concrete. They add to the attractiveness of the grounds.

down the concrete. This operation forces particles back from the edges, removes air bubbles and produces a dense concrete with smooth surface.

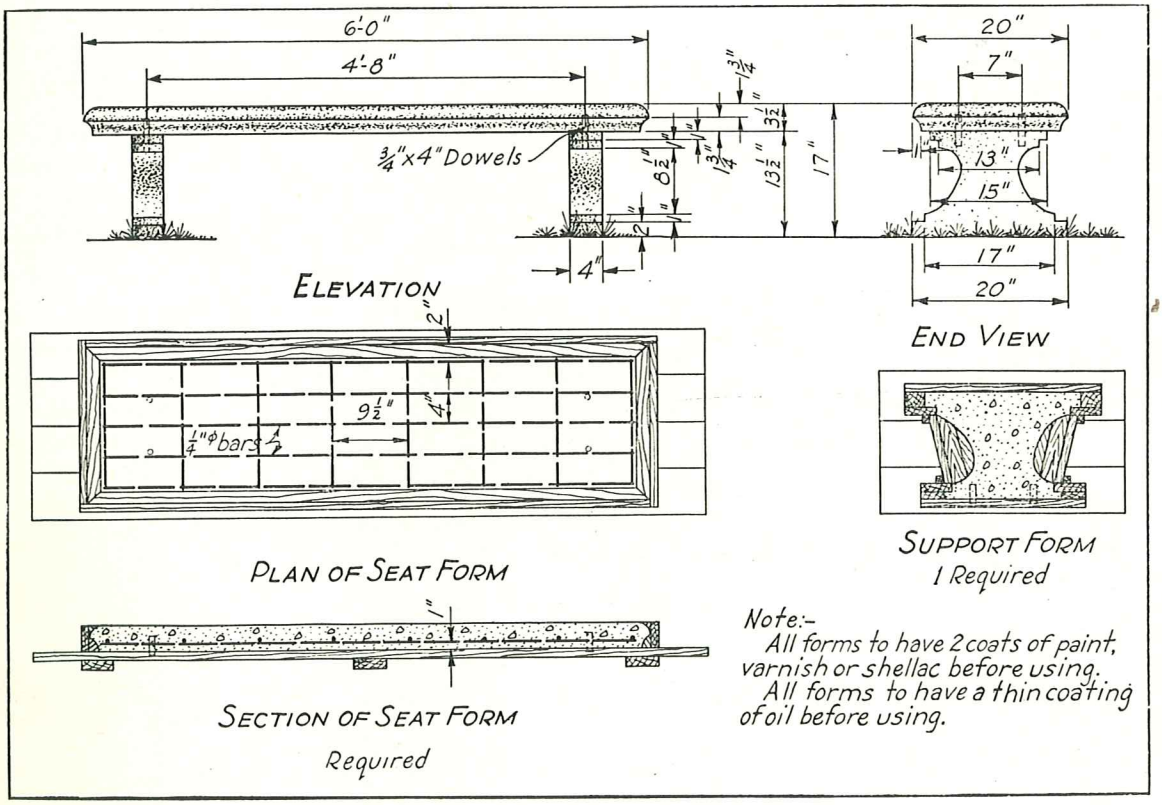
After the forms have been filled they should remain undisturbed for at least 24 hours and during cold weather, for 48 hours. Great care should be exercised in removing the forms so as not to injure the green concrete. The supports and seats upon being removed should be covered with sand or straw, kept moist for at least 10 days. The bench should not be set up for at least four and preferably six weeks. Three-quarter-inch hard wood plugs may be used for dowels to attach the seat to supports. Various surface treatments are described on page 40.

Where garden furniture is to be placed on the turf it is essential that a good solid footing be provided to prevent settlement when the ground becomes soft. Footings for benches should cover about double the area of the base of each standard—a depth of 6 inches is usually sufficient.



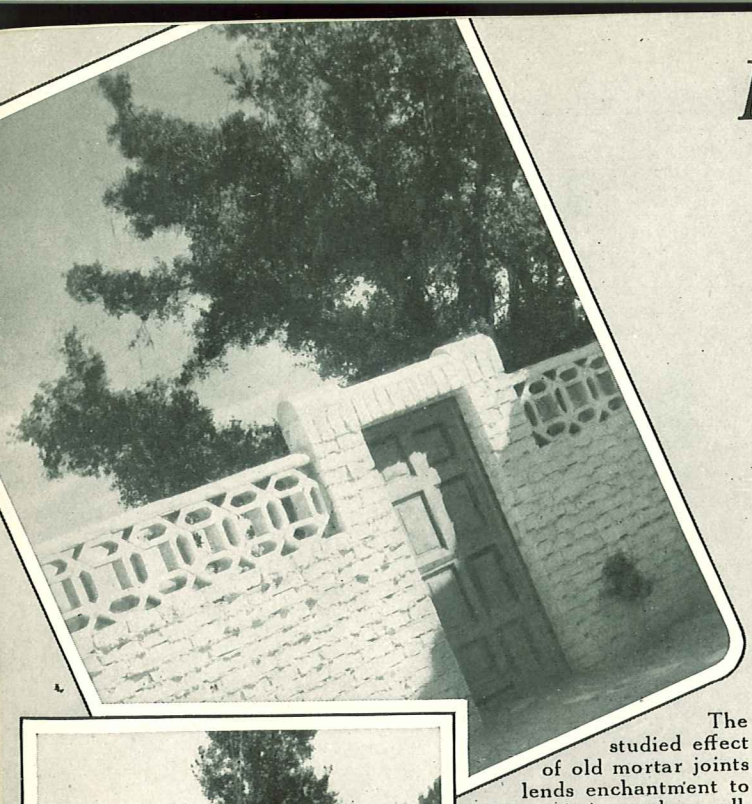
A lawn bench with permanent concrete standards.

To prepare the footings dig holes of the required size and depth and fill with a mixture of concrete of the same mix as used for the bench. Tamp well, level off and allow to harden 24 hours before placing the bench upon them. If placed first, the footings will harden while the bench is being built.

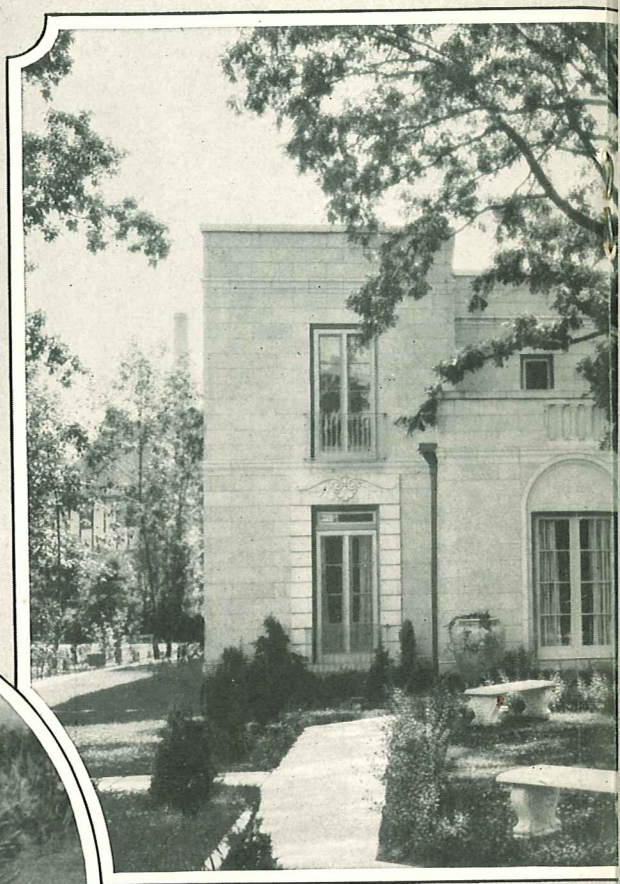


Details of construction for a simple concrete bench.

Permanent, Useful Conc
Add Beauty to



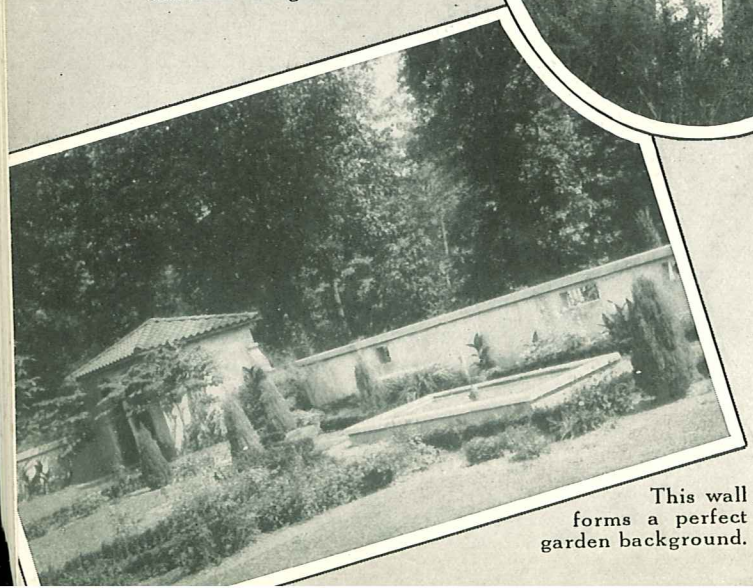
The studied effect of old mortar joints lends enchantment to this artistic garden wall.



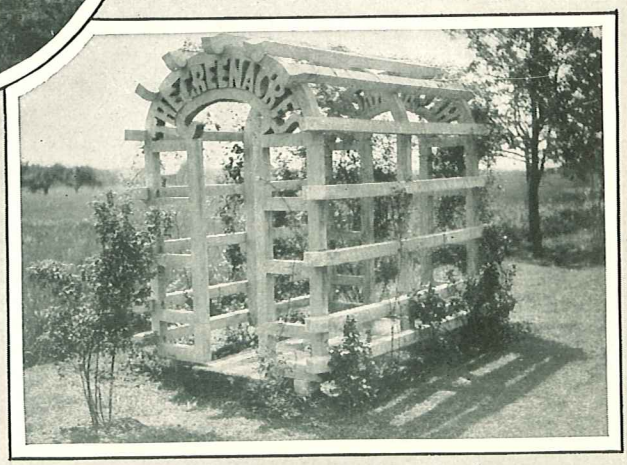
The beauty of this con enhanced by the well-p ornar

Concrete can be readily molded into intricate designs.

The gazing globe mirrors the garden plantings and brings a bit of brightness to the green lawn.



This wall forms a perfect garden background.

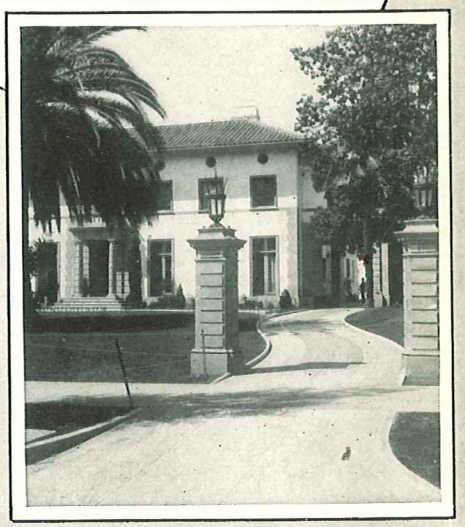


An interesting concrete rose arbor.

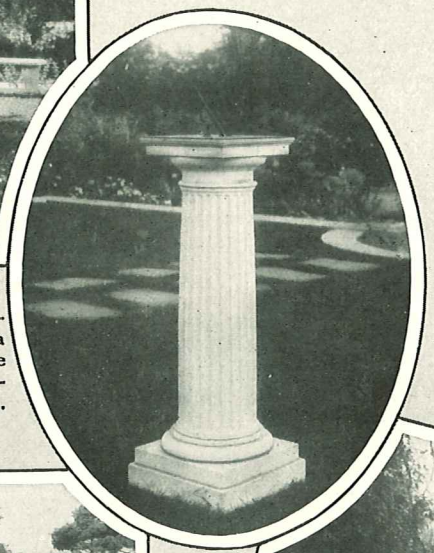
crete Improvements Will o Your Home

ncrete masonry home is placed concrete garden ments.

The ruggedness of these concrete steps blends perfectly with their rustic surroundings.



An unusually attractive driveway. The entrance posts are also of concrete.



An artistically designed pedestal for a sun dial. These time tellers are always interesting in the garden.

A swimming pool on the home grounds.

Garden walls of concrete are maintenance-free.

CONCRETE BIRD BATHS AND PEDESTALS

A BIRD bath is an attractive feature for the lawn or garden and is worthy of much wider use. It is not alone valuable as an ornamental feature in a garden, but has the additional merit of attracting the little feathered visitors, enlivening the scene with life, color and song. The bird bath should always be placed in the open and never close to shrubbery as birds will not use it if near a hiding place for lurking cats.

Plans for the construction of a simple bird bath and pedestal are given on page 27. The forms for the pedestal are assembled as shown; shellac to prevent warping and oil their interior surfaces to facilitate removal. Using the concrete mixture as recommended in the table on page 43 fill the form, tamping thoroughly and smoothing off the top with a trowel. Reinforcement for the pedestal consists of four ¼-inch steel rods bent as shown and placed so that they will not be nearer than one inch to the surface. In placing the concrete, deposit a small amount compacting it by tamping with a stick or lath cut like a chisel at one end. Take pains in placing the concrete so that the reinforcement will not be disturbed. After the concrete is placed a round hard wood plug or dowel is centered in the fresh concrete to provide attachment for the separately-built basin.

A concrete bird bath introduces variety into the lawn or garden and attracts little feathered visitors.

A smooth platform about 36 inches square is required in building the bowl. A ¼-inch bolt 8 inches long is fastened in an upright position in the exact center of the platform. This bolt is used as a pivot for the templates which shape the core and the bowl of the bird bath.

The two templates for the basin may be made of wood as shown or cut from sheets of metal. The curvature may be varied to suit the individual taste. The mold or core, forming the basin, is built up of moist clay or a plastic clayey mixture. Template No. 1 is placed on the bolt and revolved as the clay is built up to produce a smooth, even core. Template No. 1 is then removed. After the clay has stiffened, which will require several hours, a one-inch layer of concrete is placed over the

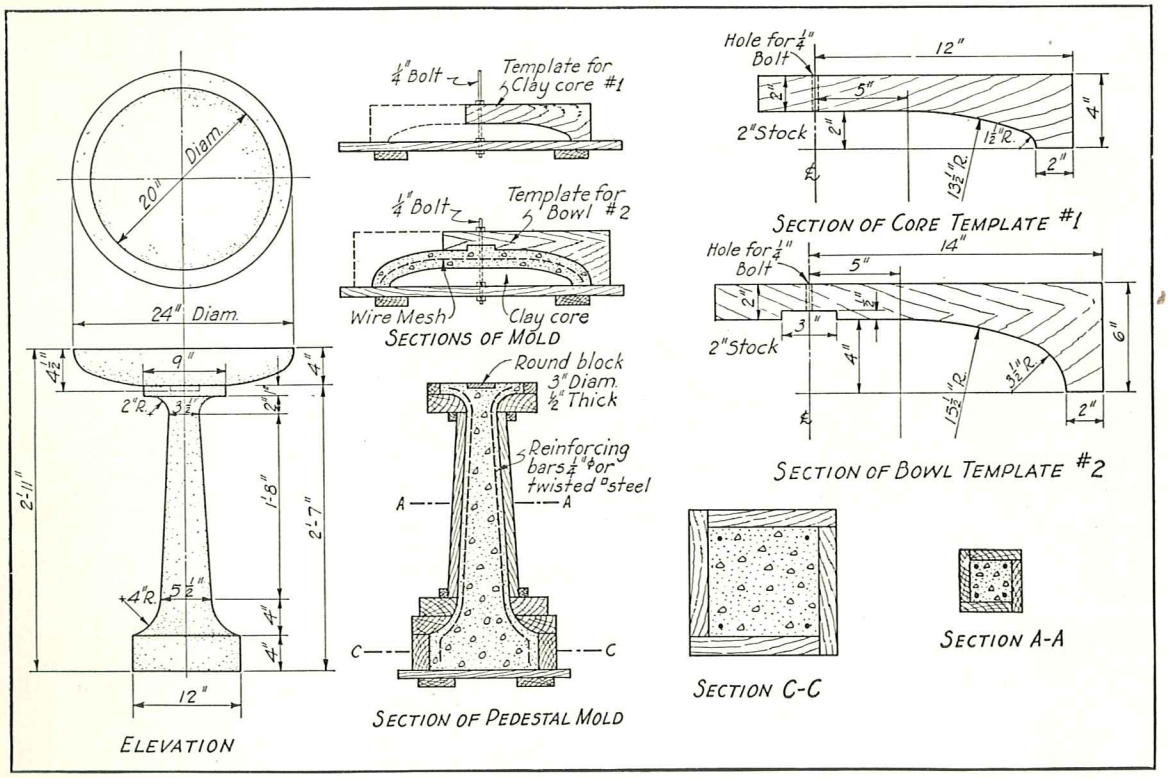
An attractive formal garden. All ornaments, including the pool, benches, wall and pedestal for gazing globe are of concrete.

clay and the reinforcing mesh is put in position. The second template is then placed on the bolt or pivot and as more concrete is placed the template is revolved and the bottom of the basin formed. The concrete mixture in this case must be stiff so that it will not slide down. Less water or slightly more aggregate than will produce a customary workable mix will accomplish this. Use 4 gallons of water per sack of cement or relatively less if aggregates are moist. See table on page 43. After concreting has been completed the surface may be lightly trowelled to obtain the desired smoothness.

Allow the pedestal and basin to harden for about 48 hours after which they may be assembled by means of hard wood dowel. The entire bird bath may be given a cement wash. Another popular treatment is to expose the aggregate by scrubbing the surface with a solution of muriatic acid.

This pedestal design may be used for any of a number of garden ornaments including the sun dial, the gazing globe, urns, flower boxes, etc. In some cases such as for the sun dial the top of the pedestal will have to be made slightly larger than shown for the bird bath. Twelve inches square is about right for the average sun dial. If placed on the turf, always provide a foundation for the pedestal slightly larger than the area of the base and about 8 inches thick. To prepare the foundation, dig a hole of the required size and depth and fill with concrete of the same mix as used for the pedestal.

A flower pot and pedestal of concrete.

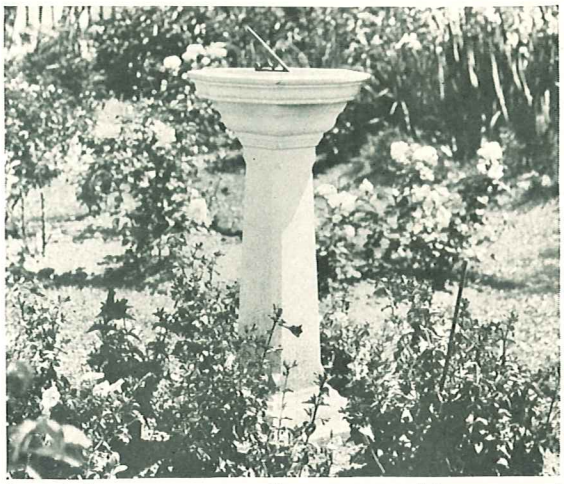


Plans for concrete bird bath and pedestal. The pedestal design may be used for sun dials, gazing globes or other ornaments.

SUN DIALS

THE sun dial is a garden ornament of many years standing and one in which designs range from simple to elaborately ornate. A sun dial is often treated as a central feature of the garden or lawn and as such is given a prominent position. Sometimes, however, it is treated as an isolated feature and placed in some secluded nook where it makes a decidedly favorable impression on one coming unexpectedly upon it.

An attractive sun dial of simple design can be readily made by following the plans given for the pedestal described on page 27. As mentioned on page 27 the top of the pedestal will have to be made slightly larger than shown for the bird bath. The dial itself is often made of brass or bronze and may usually be secured from stores dealing in lawn and garden equipment. While the weight of the dial is usually sufficient to hold it firmly on the pedestal it is good practice to cement it in place or put it into a depression cast in the top of the pedestal to receive it. When placing the sun dial always see that its vane points to the north.



Sun dials are a never-ending source of interest and serve as an attractive focal point in the garden.

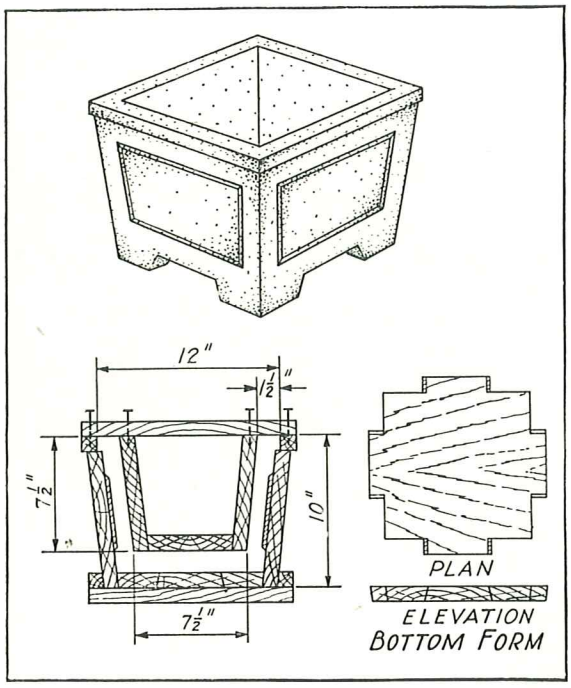
FLOWER POTS, URNS AND VASES

SIMPLICITY in garden adornment is always in good taste. Attractive concrete flower pots and window boxes, of similar design to those given on page 29, are inexpensive to install and will improve the appearance of the home surroundings.

The surfaces of forms next to the concrete should be sand-papered smooth and at

Permanent beauty can be molded in concrete, as witness this attractive flower urn.

Flower boxes like this one can also be built for window ledges.

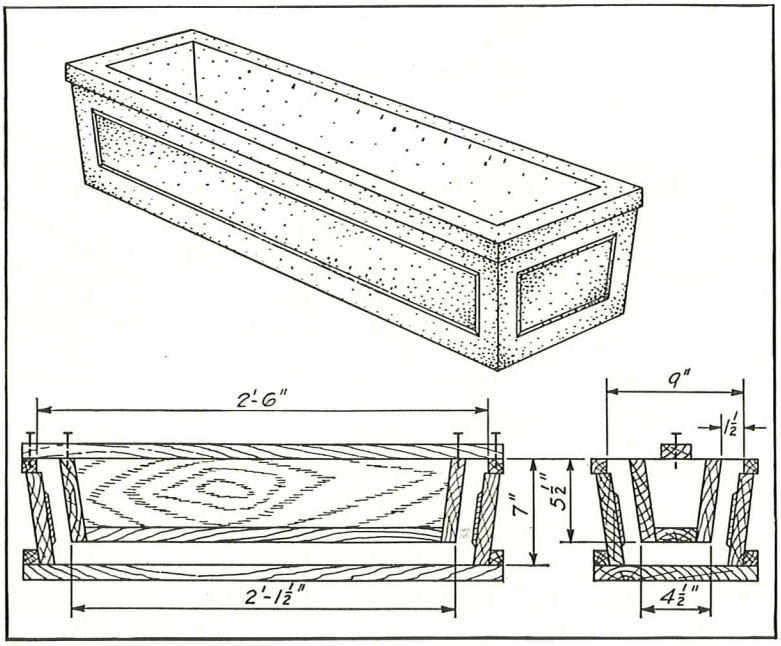


Plans for a simple concrete flower pot.

The artistic design and unusual placing of this concrete urn lends charm to the garden.

least two coats of shellac applied to prevent warping. When assembling take care to have both inside and outside forms exactly centered. Oil the form faces well before placing concrete.

The recommended concrete mixture for this class of work is shown in the table on page 43. As the forms are filled, press the concrete into the corners. Allow the concrete to harden for at least 24 hours before removing forms. The outer form is removed first. Any irregularities or bubble holes are filled at this time with a wash of cement and water mixed to the consistency of thick cream. The entire inner and outer surfaces may then be coated with this mixture. Cure for at least a week wetting thoroughly every day. Where pedestals are desired for supporting flower pots or boxes, urns, vases, gazing globes, etc., the plans given on page 27 may be followed.



Plans for concrete flower box, suitable for either window ledge or pedestals.

This attractive garden rests on an eight-inch concrete roof of a garage and serves an adjoining apartment building. The flagstone walk. the pool and benches are of concrete; the wall is of concrete masonry.

CONCRETE LAWN AND GARDEN POOLS

ORNAMENTAL pools are a never ending source of delight. Concrete is ideally suited for pool construction because being easy to mold it lends itself to a wide diversity of designs. A concrete pool is inexpensive to build, free from maintenance, lasts indefinitely and retains its beauty.

A wide variety of aquatic plants suited to the garden pool may be obtained and the selection of the size of the pool is somewhat dependent upon the type of plants to be grown. Small species of water lilies for

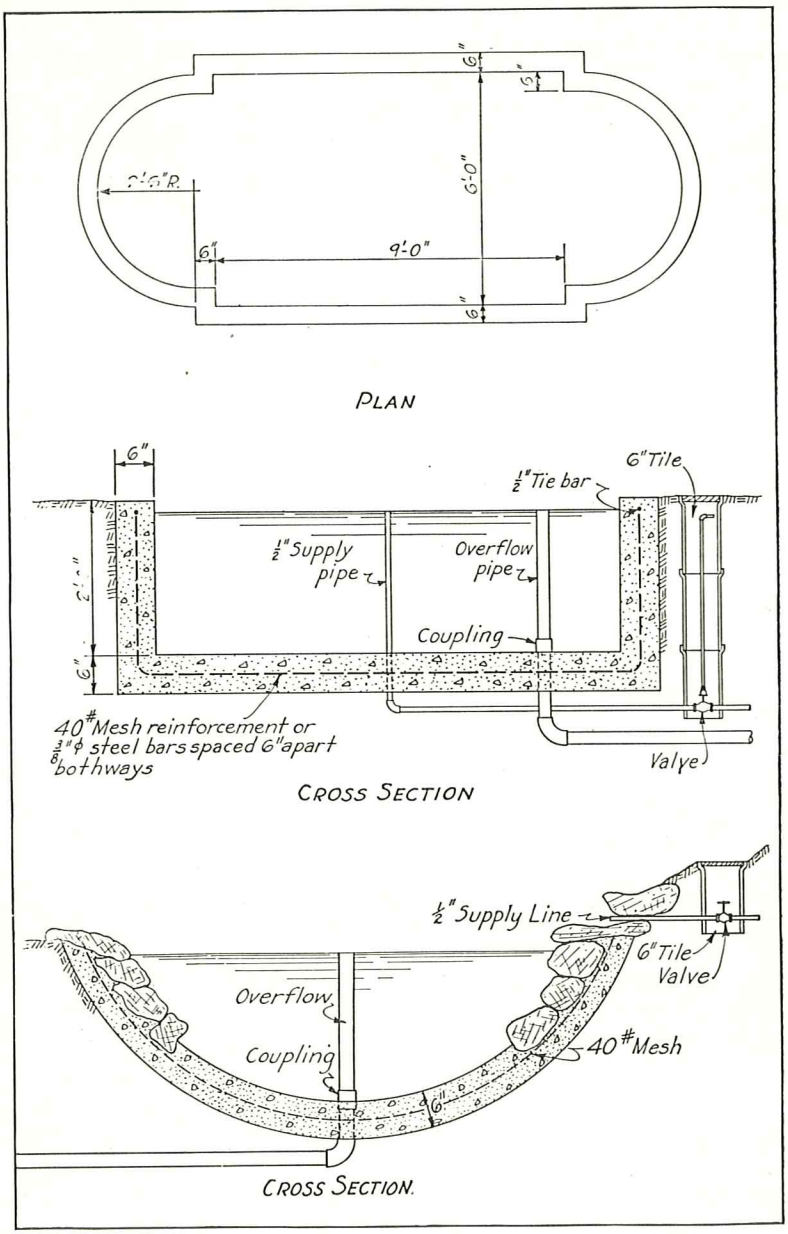
A pleasing combination of concrete garden pool, fountain and wall. The concrete fountain has been stained to resemble weathered bronze, as described on page 41.

instance will require a pool only 3 feet in diameter while larger varieties require a pool at least 6 feet in its least dimension.

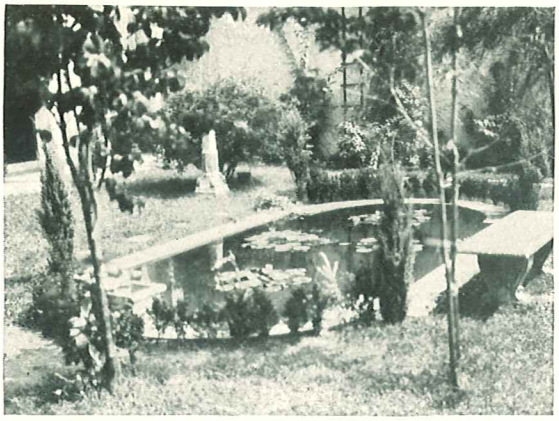
The depth is dependent upon the type of planting (water lilies require at least 22 inches) and the climatic conditions. In severe climates shallow pools are likely to freeze solid in the winter and kill the plants unless precautions are taken. The usual method of preventing an excessive thickness of ice from forming is to board the pool over and cover with straw or leaves. Gold fish should always be removed from the pool in winter but lilies will not be harmed if the ice does not freeze to a depth of more than two or three inches.

A simple and attractive design for a small pool is shown on this page. If desired the curved ends shown may be eliminated and the plans altered to suit individual requirements.

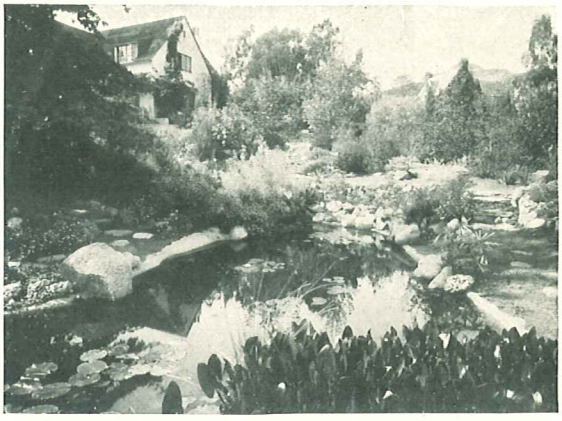
Excavation to the desired form and depth is the first step in construction. If the soil is firm no outside form will be needed. When the soil is loose and crumbly both inner and outer forms will be required. The pool should rest on well compacted ground and a 6-inch cinder or gravel fill is recommended. Forms for the curved ends of the pool are made of 20 gauge galvanized iron. Since the pool must resist exterior soil pressure and in the winter, interior ice pressure, reinforcement must be used and placed as shown. It is necessary that concrete for the floor and walls be placed in one operation so that there will be no construction joints and therefore less possibility of leakage. Support the interior form across the top of the excavation so that it hangs six inches from the bottom of the pit. Be sure to oil the inside faces of the forms well before concreting to facilitate their removal. Deposit only 6 to 8 inches of concrete at a time in the wall forms and see that it is well



Plans and construction details for two types of garden pools.



This pool, simply landscaped, adds definite beauty to this garden.



This irregularly-shaped lily pool is in perfect harmony with the natural surroundings.

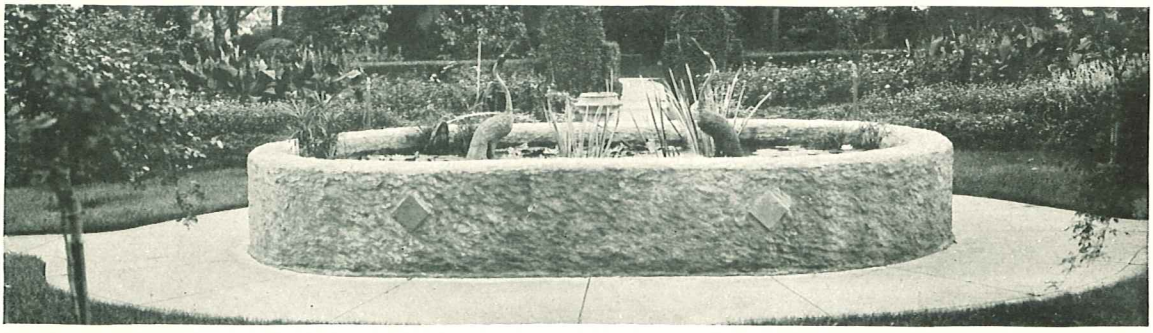
tamped and spaded. A garden hoe which has been straightened out makes a good tool for this operation. The reinforcement is put in position before the concrete is placed. Take care that it is not displaced by tamping. Forms are not removed for at least 48 hours after concreting.

The concrete must be watertight. Use the recommended mixture shown in the table on page 43 for the walls and floor. If lilies are to be grown in the pool and tubs are not desirable several circular pits 10 to 12 inches in diameter may be provided in the floor of the pool. A regular lily tub may be used as a form for this work. The walls and floor of the lily pit should be the same thickness as the pool floor.

A concrete coping or curb may be placed around the pool if desired. Under some conditions boulders around the margin are pleasing, particularly when the pool is somewhat shaded, and ferns and other shade enduring plants may be planted between the boulders.

Often pools are built entirely above grade and where this is done a firm foundation of concrete from 2 to 3 feet deep should be provided. The forms and general construction of this type of pool will be practically the same as the below grade type, except that both inner and outer forms will be required.

A realistic rock pool may be constructed by making an irregular excavation with a bowl-shaped bottom. If the concrete is made in accordance with the recommended mixture given on page 43 and the sides are not steeper than a rise of one foot in two feet no forms will be needed. Natural rock may be set in the concrete before it has hardened. To make the rocks secure they should be set in a mortar of one part port-

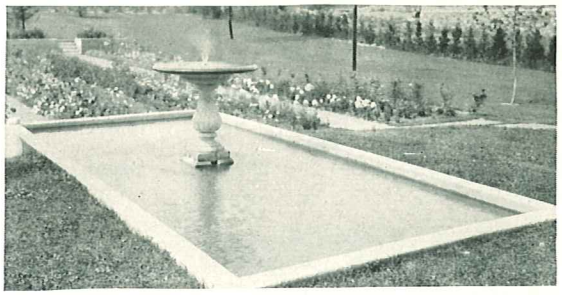


Distinction in both finish and plan mark this unusually attractive concrete lily pool. It is finished with portland cement stucco in a bright color to harmonize with surrounding plantings.

land cement and three parts sand. Any mortar which is visible between rocks should be removed before it has hardened.

While the pool may be filled with a garden hose, pipe connections with the local water supply are desirable. The pool may be emptied by siphoning or by a drain in the bottom. In the latter case the overflow serves also as a drain by unscrewing the length of pipe above the coupling set flush with the floor of the pool. When this method is used a wire basket is placed over the outlet in case fish are kept in the pool. All plumbing connections should be made before concreting begins.

Bog gardens are often desirable for the growing of semi-aquatic plants. Japanese iris is a popular plant for this type of garden. To construct such a garden, excavate to a depth of 16 to 24 inches and build a reinforced concrete box 4 inches thick. Fill the box with a rich soil such as old turf mixed with well rotted cow manure.



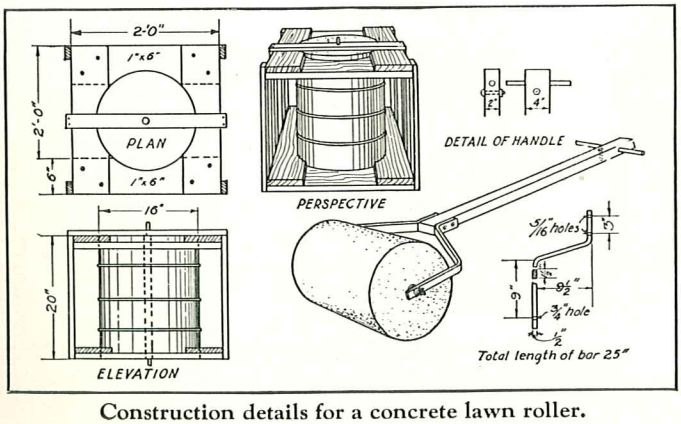
An attractive garden pool made from the plan on page 31 with the curved ends eliminated.

LAWN ROLLER

A CONCRETE lawn roller is a practical and useful implement that will last a life time. Plans for making one are shown on this page. The forms are assembled as indicated, on some flat surface, fitting the clamps around the galvanized iron sheet which is bent to circular form with its ends overlapping. If necessary the metal may be tacked to the clamps. An iron pipe is set in the exact center of the form using wooden strips with accurately bored holes to fit the pipe at top and bottom. Oil all surfaces with which the concrete will come in contact to make removal of forms easy.

The proper mixture for this type of work is shown in the table on page 43. Place the concrete in the forms spading it well and smooth off the top with a trowel. Metal form may be taken off after about 48 hours and any holes in the surface filled with 1-2 cement-sand mortar. Allow roller to cure for at least 10 days, wetting thoroughly every day. After it has cured thoroughly, the roller may be assembled as in sketch. A handle such as shown can be obtained from the local hardware dealer, or the handle may be made with a few sections of pipe and fittings as shown in the photograph.

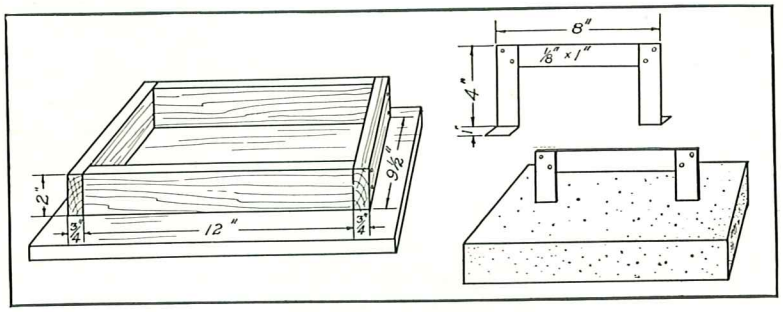
This lawn roller was built from plans given below.



Construction details for a concrete lawn roller.

A MOVABLE SHOE SCRAPER

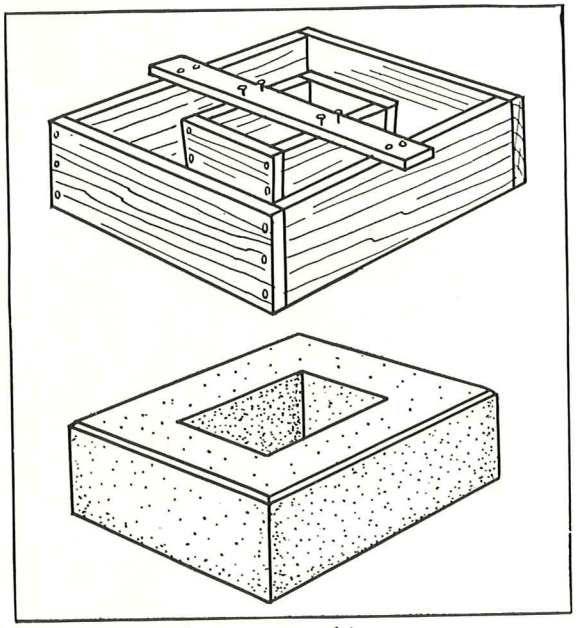
A HANDILY placed concrete shoe scraper is a home improvement which will be welcomed by every housewife. Assemble the forms and rivet the iron straps together as shown on this page. Using the concrete mixture recommended in the table on page 43, fill the forms holding the metal scraper in the center of the form about ¾ of an inch above the pallet. Tamp well and smooth off the surface using an edger to round off the outside edges. After the scraper has hardened for about 24 hours, carefully dismantle the forms and remove the block. Allow it to cure for at least 10 days before using. When a sidewalk is to be built at the house entrance, a shoe scraper may be set in place as shown in photograph on page 8.



Plans for movable shoe scraper.

CHIMNEY CAP

A CONCRETE cap on a chimney not only prevents the masonry work at the top from falling apart but gives the chimney an attractive finished appearance. Both inside and outside dimensions of the chimney for which the cap is intended must be obtained. Using these dimensions, 1 by 6-inch form boards are marked off, making allowance for overlapping on the ends. In assembling the forms, the inner core which has its sides beveled to facilitate removal is held in proper position by a board nailed across the top of both forms. This also prevents the outer form from bulging when the concrete is placed and tamped. Oil form faces next to concrete to make their removal easy.



Plans for concrete chimney cap.

The mixture of concrete for this work is given in the table on page 43. Mixing, curing and other details of concreting should be followed as described.

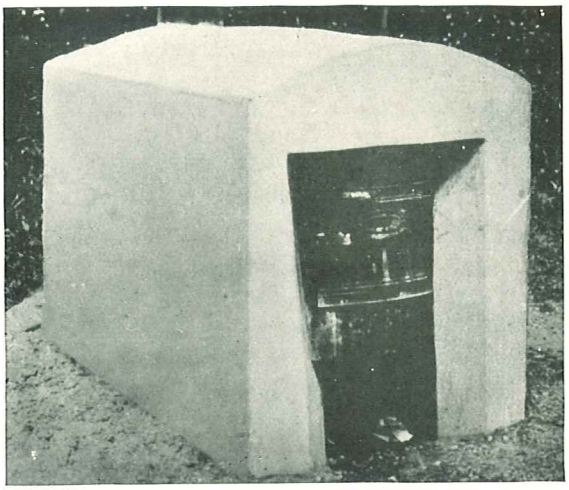
No. 12 wire for reinforcement should be placed in the concrete as it is deposited. The wire should be bent to extend entirely around the cap about 1 inch from the outer edge. Forms may be usually removed in 24 hours, withdrawing the inner form first. To render the removal of the outer form easy and without damaging the concrete, it is good practice to allow the nail heads to project about ¼ inch when forms are assembled.

REFUSE BURNER

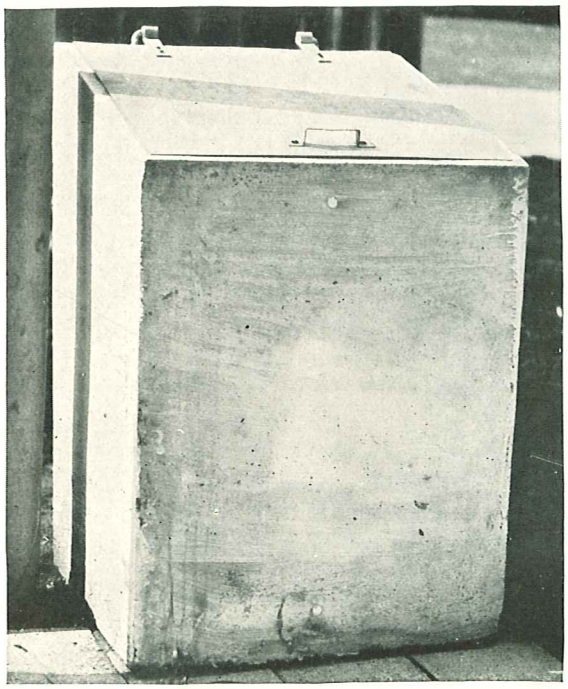
A CONCRETE masonry refuse burner is a useful home convenience that is inexpensive. Plans for making one are given below.

An excavation is made 6 inches deep having a smooth, well compacted surface upon which the base is laid. The base form is then assembled and set in place. This form is constructed similar to that shown on page 4, for sidewalk construction; no crosspieces are used, however. The recommended proportions for the concrete for this work are shown in the table on page 43. Place the concrete in the form, tamping it thoroughly. Level off the surface by means of a strike board resting on the edges of the form. Allow the base to harden for at least 24 hours before removing the forms.

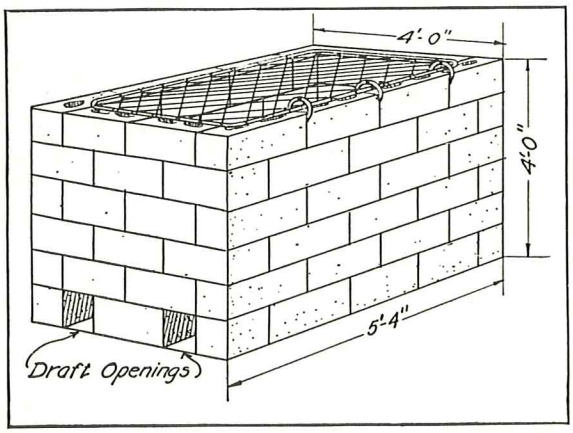
Concrete block or tile used for the walls and ends may be secured from a local dealer. A 1-1-6 mortar (one part cement, one part lime and six parts sand, all measured by volume) is recommended for laying up the units. The bottom course of masonry is laid as indicated in the drawing with half units at the corners, leaving draft holes at each end as indicated. The succeeding courses of units are placed spreading a bed of mortar ½ inch thick on each preceding course. Be sure to break joints as indicated. Each unit as laid is "buttered" on the ends to make well filled vertical joints. A square, straightedge, and plumb are used to keep the courses even and the walls vertical. Allow the mortar to harden for two weeks before using the burner.



A concrete incinerator provides a handy means for disposing of refuse from the home.



Concrete garbage and ash receptacles are sanitary conveniences.



Plans for a simple refuse burner built of concrete masonry.

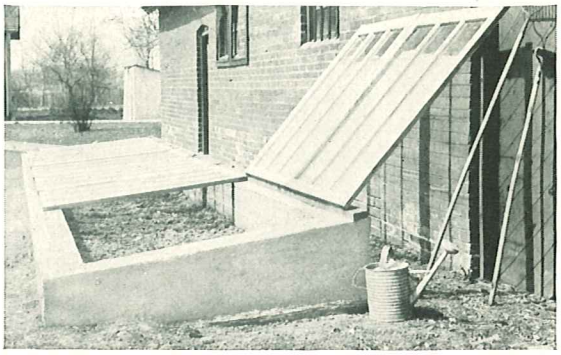
HOT BEDS AND COLD FRAMES

AN easy way to extend the season of the home garden is to build a concrete hot bed or cold frame. Advancing early spring plants is another use. Cold frames and hot beds are much the same except that the walls of the latter are usually carried deeper into the ground to form an inclosure for a filling of manure.

The location of beds should be such that full exposure to the sun is obtained. Protection from winds is desirable and in this respect the location on the south side of a building is ideal provided the water from the eaves does not drip on the beds. A well drained site should be selected if possible since excess moisture checks the fermentation of the manure, reducing the amount of heat generated. Plans for building a simple hot bed are given below.

Pits for hot beds are usually dug from 10 inches to 3 feet below the surface of the ground. The length is made some multiple of 3 feet as this is the width of standard hot bed sash. The width of the bed is also made to accommodate standard sash. On small beds old window or storm sash may be utilized provided the bed is made of dimensions to suit.

For a 4-sash frame the excavation should be laid out 6 feet, 6 inches in width by 12 feet, 9 inches in length. The latter dimensions allow for necessary sash supports or bars which run across the bed. These are made of 1-inch dressed lumber and resemble an inverted "T" when in place. Walls of the bed are made 6 inches thick and are carried down to below frost penetration.

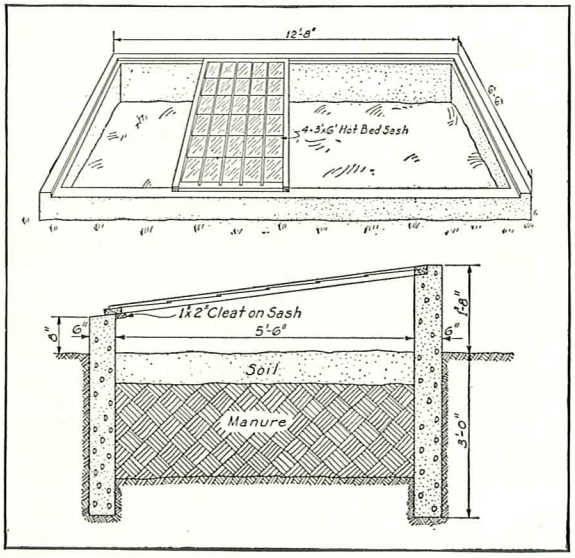


Hotbeds and cold frames built of concrete are rotproof and permanent.

The bed is usually constructed so that the top of the south wall is about 6 inches and the north wall 12 to 18 inches above grade. This gives a slope from 6 to 12 inches. As it is difficult to dig a 6-inch trench for concrete walls it is customary to make the excavation for the bed first, utilizing the earth for the outer forms up to ground level and using 1-inch boards above grade and for the inner forms. Recesses may be cast in the top surfaces of the wall to receive sash, thus insuring a tight fitting frame.

Where plants requiring different degrees of heat and moisture are grown in the same frame, provision is made for insertion of partition planks by casting slots opposite each other in the walls. This is readily done by tacking beveled strips to the inside of the forms, driving nails through the forms into the cleats.

The recommended mixture of concrete



Perspective and cross-sectional views of a four-frame concrete hotbed.

for this type of work will be found in the table on page 43. Read carefully the instructions for proportioning, mixing, placing and curing.

When the concrete has hardened, hot beds are banked with earth and the embankment is sometimes covered with straw or manure to prevent loss of heat. This banking is customarily made 12 to 15 inches wide at the base, sloping to about 6 inches at the top.

Cold frames differ from hot beds in that no manure is used to supply the heat. Soil for cold frames should be of sandy nature as it responds more quickly to fertilizer, is usually better drained than heavy soil, and plants are not so apt to be injured by excessive watering.

Drainage, both surface and underground, is essential and the ground should therefore slope away from the site of the bed. Without ample drainage, water may collect in the pit and delay the growth of the plants. Excess water not only delays the growth of the plants but also seriously checks the fermenting of the manure. A tile drain about 4 inches in diameter is often placed so that the bed will be drained should any water chance to collect. This drainage is facilitated by a layer of coarse gravel about 4 inches deep in the bottom of the pit.

TREE SURGERY

MANY a fine old tree whose heart is being eaten out by decay can be given a new lease on life by the intelligent use of a little concrete. Cavities occurring from any cause gradually increase in size until through lack of nourishment, the tree starves, weakens and eventually dies.

The cavity should first be thoroughly cleaned, the dead and decayed parts being cut out regardless of the size of the wound which is made. Fungus growths left in the tree under the concrete will cause decay to continue. The entire surface should then be treated with a germicidal solution such as creosote, or crude petroleum.

Following this a thick coating of hot tar should be applied to act as an expansion joint. Then slight movement of the tree will be less likely to cause the concrete to crack. If the cavity is large the concrete should be reinforced. This may be accomplished by driving a number of 20-penny nails in the cavity and by using ¼-inch rods extending from side to side of the opening.

Fine old trees can be given a new lease on life by the intelligent use of concrete.

Before filling the cavity the surrounding bark should be cut back about one-half inch from the face of the opening in order to prevent its being injured while work is in progress. Use the concrete mixture recommended in the table on page 43 for this work. Take care to work the concrete thoroughly into every part of the cavity.

If the cavity is so open that a form is required to hold the concrete in place while hardening, heavy burlap or sheets of tin may be tacked across the opening. When the concrete has partially hardened, these should be removed and the surface finished to conform to the natural shape of the tree. Damp burlap should then be lightly fastened over the concrete and kept moist for about 10 days. The bark and sap wood will eventually grow over the concrete filling.

CYCLONE AND STORAGE CELLAR

EACH year tornadoes and cyclones sweep across the country leaving paths of death and devastation in their wake. Loss of life due to these storms may be largely prevented with safe, concrete storm cellars located near the house. The cellar will also serve as an ideal winter storage place for small quantities of fruits and vegetables.

This concrete cellar provides safe refuge from tornadoes and a good winter storage for fruits and vegetables.

Concrete is most widely used for storage and cyclone cellar construction since the damp earth covering would cause less permanent materials to decay. Concrete is also water tight and possesses the strength necessary to sustain the earth covering.

A number of different designs for combination storage and cyclone cellars have been developed in which either concrete masonry or monolithic construction may be used. Appropriate literature containing plans and construction details will be sent upon request. Ask for our booklet "Farm Storages for Fruits and Vegetables."

FIREPROOF GARAGES

THE amount of money invested in the average motor vehicle justifies a garage that will afford good security against fire and theft, protection against the weather and reasonable convenience in its use. Concrete garages meet these requirements at minimum first cost and have the additional merits of long life, low maintenance and ready adaptability to harmonious design with the architecture of the residence.

Firesafety, beauty and permanence are combined in the garage built of concrete masonry, portland cement stucco and concrete roofing tile.

Garage walls may be of monolithic or concrete masonry construction, the latter being the most popular. An endless variety of colors and surface finishes is possible with portland cement stucco, the usual method of surfacing garages built of concrete masonry.

Roof as well as walls should be of nonburnable construction. This is obtained through the use of concrete roofing tile or cement asbestos shingles either of which may be obtained in a number of attractive colors.

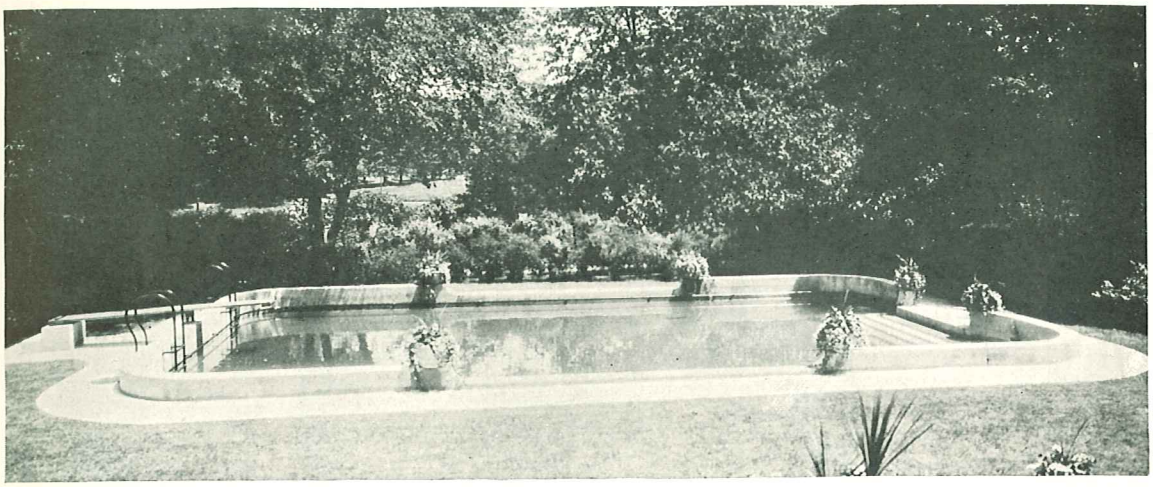
For a single-car garage an inside width of 12 feet has been found very satisfactory and for a two-car garage, 20 or 22 feet. A length less than 20 feet is seldom advisable and for large cars 22 feet is better. These dimensions will allow plenty of working space around the car and provide room for a small work bench, closets and shelves for car accessories at one end.

Literature on concrete garages will be sent upon request.

CONCRETE SWIMMING POOLS AND TENNIS COURTS

TO many persons swimming is one of the most enjoyable sports and health authorities agree that it is one of the most healthy. Indulgence in swimming, however, is often limited by the lack of a natural body of water. Of late years the private pool on the home grounds which the family may enjoy has become very popular.

The pool need not be large, 15 by 30 feet is ample, and can be placed in the garden or on the lawn. It can be made to add to the general beauty of the home grounds as well as to provide a source of pleasure.



A swimming pool on the home grounds adds to the general beauty and provides a constant source of pleasure

A pool need not be regular and severe in design but can be made in an artistic shape to blend with the natural surroundings. The pool may be surrounded with natural stones and landscaped to give an atmosphere of the tropics or that of the "old swimming hole."

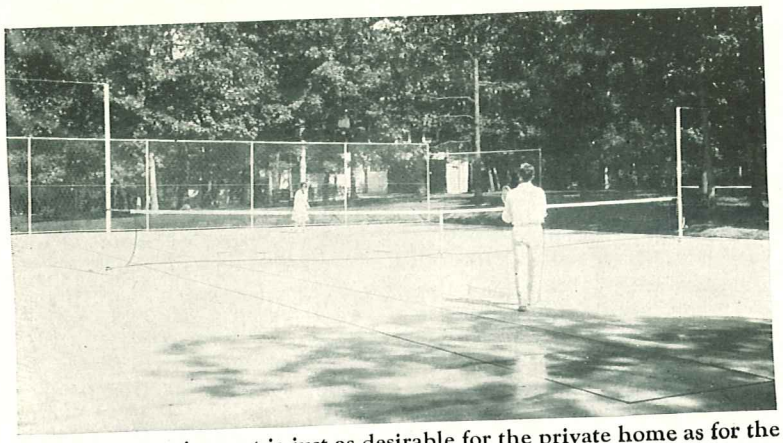
Tennis Courts

Tennis develops alertness of mind, coordination of muscles and endurance; it is one of the most popular games of the American people. One of its appealing features lies in the fact that but two players are required for a match, while in many other sports it is necessary to assemble from ten to twenty players before a match can be arranged. Due to the great interest in tennis and the difficulty in obtaining public courts to play upon, private courts on the home grounds are finding increasing favor.

Concrete serves admirably for tennis court construction. Where other sports are seasonal tennis can be made an all season form of recreation since properly constructed concrete courts can be kept in condition for play throughout the year.

They drain quickly after a rain and do not require dragging, rolling and relining after a storm. The smooth surface and sharp lines painted on or set in the surface are permanent. The fact that concrete courts remain smooth without attention is one reason for their popularity in recreational centers. During cold weather the court may be flooded and used for skating without damage to the surface.

An excellent tennis court suitable for



A concrete tennis court is just as desirable for the private home as for the park and makes possible year 'round play.

four players can be built on an area only 55 by 110 feet and even smaller areas have proven practical as the actual size of the court is only 36 by 78 feet. The size of a court for two players is 27 by 78 feet.

Literature and plans for the construction of swimming pools and tennis courts are available upon request. Ask for "Swimming Pools" or "Tennis Courts for All-Year Sport."

SURFACE TREATMENTS

ONE of the outstanding advantages of concrete is the ease with which it may be manipulated to secure readily a great variety of surface finishes. Some of these finishes are given entirely after the work has been completed while others are partly arranged for when the materials are selected.

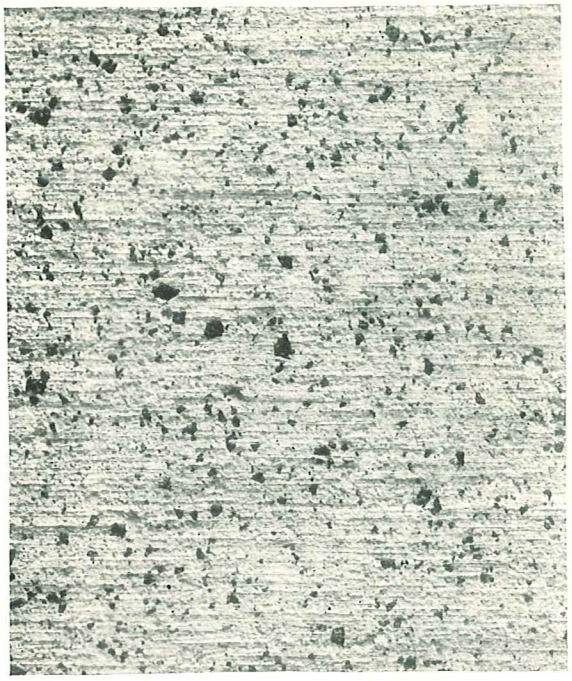
The simplest of all surface finishes is that imparted to the concrete by the forms. These may be made smooth, rough, panelled, etc., as desired.

Many times a mixture of cement and water of the consistency of thick cream is applied to the concrete upon removal of the forms. This produces a very smooth surface of a gray (or white, if white cement is used) color. Rubbing the surface of the concrete immediately after the forms have been removed with a carborundum stone is another method of securing a smooth surface. This rubbing treatment eliminates grain markings of wood forms and fills the surface pores and small cavities.

Probably the most attractive finishes that can be given to concrete are those which are prearranged when mixing the materials. Selected aggregates are chosen principally because of their color as well as for their ability to take polish. Aggregates of white sand, marble chips, granite screenings, crushed felspar, mica-spar, crushed slag, garnet sand and similar colored rock materials are often used. The mixtures are prepared and placed in the usual way and the surface finish is secured by washing off the film of cement that coats the particles on the surface thus exposing them and revealing their color.

This concrete flower pot shows the adaptability of surface treated concrete to fine ornamental work.

When forms are removed within 24 hours after placing the concrete the surface film of cement can usually be washed off by spraying with water under pressure or by scrubbing with a stiff brush, keeping the surface wet with water. When the concrete has become too hard to yield to this treatment, an acid wash consisting of one part common muriatic acid to four or five parts of water is used. The wash is applied with a brush scrubbing lightly until the film of cement has been removed—the surface must be quickly and thoroughly washed with clean water immediately afterwards to remove all traces of the acid and to prevent its further action.



A close-up of a concrete surface which has been given a tooled finish.

There is a wide variety of color and textures for surfaces which may be secured by exposing the aggregate. Different combinations of the materials produce an entirely different effect. A mix of yellow and white marble chips or a mixture of gray granite screenings and black crushed slag with a little mica-spar are examples of possible variations.

Concrete surfaces are often tooled just as natural stone is cut. Particular attention must be given to the selection of aggregates and proportioning of concrete if this treatment is to be applied. There must be enough cement to fill all of the voids and firmly bind all particles so tooling will not dislodge them. The concrete must be harder than when other treatments are used. Aggregates must be uniformly hard and broken stone is therefore often used because natural pebbles usually vary considerably.

A beautiful surface can be secured by polishing the concrete. The degree of polish that can be obtained depends upon the thorough grading of the mixture.

Pigments are often employed in coloring concrete surfaces when the desired shades are not readily obtainable with colored aggregates. This method is also often combined with the selection of colored aggregate. For example, a uniform reddish tone may be secured by adding red oxide of iron to the cement and using pink or red granite chips for aggregate. The surface of the concrete is then treated by scrubbing with water or acid or by rubbing down with a carborundum stone. Only mineral pigments should be used when coloring concrete as organic pigments fade easily. Never use coloring matter in excess of 10 per cent of the weight of the cement in the mixture.

Flower pots, vases, urns, benches and similar objects can be given an artistic colored finish by immersing them in a solution that will either dye or stain them. Coloring may also be accomplished by placing the objects in metallic salts, depending upon oxidation on exposure to the atmosphere to complete the effect. Iron and copper sulphates are extensively used and produce a color resembling weathered bronze. Concrete surfaces treated in this manner become so hard and dense that they will take uniformly dull or high gloss polishes either of which is attractive.

PORTLAND CEMENT STUCCO

PORTLAND cement stucco is a cement plaster or slab of concrete used as a permanent coating for exterior or interior walls of concrete masonry, frame, brick or other building materials. It has all of the qualities inherent to concrete being durable, long-lived, firesafe and maintenance-free. It is water-proof, will not rot and actually grows stronger with age.

an old house a new lease on life, increased valuation becomes a real factor. A complete rejuvenation is possible if the frame of the old structure is well built. The preparation of the old wall surface to receive the stucco "overcoat" requires but a minimum of treatment. When the work is finished, in place of the antiquated structure there is a house of modern appearance still contain-

A great number of artistic stucco treatments are possible and color and texture may be chosen to harmonize with the architectural style and natural surroundings.

There are many advantages in using portland cement stucco which appeal to the home owner. It has character, beauty, strength, and is not expensive. Its economy from the standpoint of upkeep is well appreciated. The stucco house needs no paint except on the trim and on this item alone the owner will find that the money saved in a few years will more than pay for any additional cost for stucco.

Homes covered with portland cement stucco, because of their attractive appearance and their permanent construction increase the value of the property. When stucco is used as an "overcoating" to give

ing, however, the sound timbers and workmanship of the past.

A great number of artistic stucco treatments are possible and color and texture may be chosen to harmonize with the architectural style and natural surroundings. When special textures are required, it is best to secure the services of a local stucco contractor. It is generally found that best results are obtained by using factory-prepared portland cement stucco for the finish coat.

Information on how to make popular textures with portland cement stucco and suggested specifications for application may be obtained without charge by writing to the Portland Cement Association.

HOW TO MAKE GOOD CONCRETE

UNTIL the recent discovery that the strength, durability and water-tightness of concrete are dependent upon the proportion of water to cement it was customary to specify mixtures as one part cement to a certain number of parts of sand and pebbles. Modern practice is to state the amount of mixing water for each sack of cement, varying according to the class of work. For example, the recommended mixture for sidewalks and that class of work is 4¼ gallons of water per sack of cement, when sand and pebbles are in a moist condition. Moisture in the aggregates is free to act on the cement, so less water is added in this case than if these were absolutely dry. Had these been dry, the correct amount of water would be 5½ gallons for each one sack batch.

Cement Binds Particles Together

In a concrete mix, cement and water form a paste which, upon hardening, acts as a binder cementing the particles of sand and pebbles together into a permanent mass. The use of too much mixing water thins or dilutes the paste, weakening its cementing qualities. It is important that cement and water be used in proper proportions to get the best results. This is dependent upon the work.

The accompanying tables gives recommended quantities of water for different classes of work and also suggests proportions of cement to sand and pebbles to use in trial batches. The trial batch for sidewalks is 1 part cement to 2 parts sand and 3 parts pebbles (1-2-3 mix). It may be necessary to change the amounts of sand and pebbles as will be described to obtain a smooth, plastic workable mix. Under no conditions vary the amount of water from the quantity shown.

The trial proportion (1-2-3) suggested for sidewalks may result in a mixture that is too stiff, too wet or which lacks smoothness and workability. This is remedied by changing slightly the proportions of sand and pebbles, *not the water*. If the mix is too wet, add sand and pebbles slowly until the right degree of wetness is obtained. If the mix is too stiff cut down the amounts of sand and pebbles in the next batch. In this way the best proportions for any job may be determined.

How to Obtain Workable Mixture

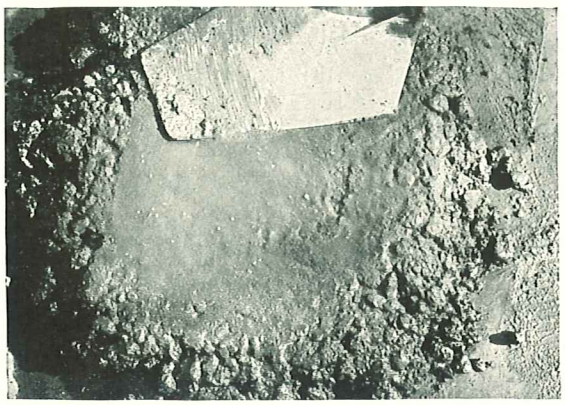
A workable mixture is one of such wetness and plasticity that it can be placed in the forms readily, and that with spading and tamping will result in a dense concrete. There should be enough cement-sand mortar to give good smooth surfaces free from

RECOMMENDED MIXTURES FOR SEVERAL CLASSES OF CONSTRUCTION

Intended primarily for use on small jobs

Kind of Work	Gallons of Water to Add to Each One Sack Batch			Trial Mixture For First Batch			Maximum Aggregate Size
	Dry Sand and Pebbles	Moist Sand and Pebbles	Wet Sand and Pebbles	Cement	Sand	Pebbles	
				Sacks	Cu.ft	Cu.ft	Ins.
Foundation walls which need not be watertight, mass concrete for footings, retaining walls, garden walls, etc.	7½	6	5	1	3	5	2
Watertight basement walls and pits, walls above grounds, dams, lawn rollers, hand tamper, shoe scrape, hot beds, cold frames, storage and cyclone cellar walls, etc.	6½	5	4¼	1	2½	3½	1½
Water storage tanks, well curbs and platforms, cisterns, septic tanks, water-tight floors, sidewalks, stepping stone and flagstone walks, driveways, porch floors, basement floors, garden and lawn pools, steps, corner posts, gate posts, piers, columns, chimney caps, concrete for tree surgery, etc.	5½	4¼	3¾	1	2	3	1
Fence posts, clothes line posts, grape arbor posts, mail box posts, etc., flower boxes and pots, benches, bird baths, sundials, pedestals and other garden furniture, work of very thin sections.	4½	3¾	3½	1	2	2	¾

rough spots, and to bind pieces of coarse aggregate into the mass so they will not separate out in handling. In other words the cement-sand mortar should completely fill the spaces between the pebbles and insure a smooth plastic mix. Mixtures lacking sufficient mortar will be hard to work and difficult to finish. Too much sand increases porosity and cuts down the amount of concrete obtainable from a sack of cement.



A concrete mixture which contains correct amount of cement-sand mortar. With light troweling all spaces between pebbles are filled with mortar. Note appearance on edges of pile. This is a good workable mixture and will give maximum yield of concrete with a given amount of cement.

A workable mix for one type of work may be too stiff for another. Concrete that is to be deposited in thin sections like fence posts must be more plastic than for more massive construction such as walls. A good rule to follow is to proportion the sand and pebbles to obtain the greatest volume of concrete of correct plasticity for the work to be done.

Aggregates

Sand and pebbles or crushed rock are usually spoken of as "aggregate." Sand is called "fine aggregate" and pebbles or crushed stone "coarse aggregate." Fine aggregates such as rock screenings includes all particles from very fine (exclusive of dust) up to those which will pass through a screen having meshes ¼ inch square. Coarse aggregate includes all pebbles or broken stone ranging from ¼ inch up to 1½ or 2 inches. In thin walls of slabs the largest pieces of aggregate should never exceed ⅓ the thickness of the thinnest section. Maximum sizes of aggregate for different classes of work are shown in the table.

Sand should be clean and hard, free from fine dust, loam and clay and vegetable matter. These foreign materials prevent bond between the cement and sand thereby reducing the strength of the concrete. Concrete made with dirty sand hardens very slowly and often will not harden sufficiently to be used for its intended purpose.

Sand should be well graded, the particles should be not all fine nor all coarse, but should vary in size from fine up to that which will just pass through a ¼-inch mesh screen. If the sand is well graded the finer particles help to fill the spaces between the larger ones.

Pebbles or crushed stone should be tough, fairly hard and free from foreign matter. Stone containing considerable soft flat or elongated particles should not be used.

Bank-Run Gravel

Bank-run gravel is the natural mixture of sand and pebbles taken from a gravel bank. In this material fine and coarse aggregates are seldom present in proper proportions, usually containing too much sand. Money can be saved by screening out the sand and recombining in proper proportions according to the class of work.

Water

Water used in mixing concrete should be clean, free from oil, alkali, and acid. In general water that is fit to drink is good for concrete.

Measuring Materials

All materials including water should be accurately measured. A pail marked on the inside at different heights to indicate quarts and gallons will be found handy for measuring water. A pail may also be used for measuring cement, sand and pebbles. In

mixing one-sack batches it is not necessary to measure cement as one sack holds exactly one cubic foot. Sand and pebbles are then most conveniently measured in bottomless boxes made to hold one cubic foot, two cubic feet, or other volumes desired.

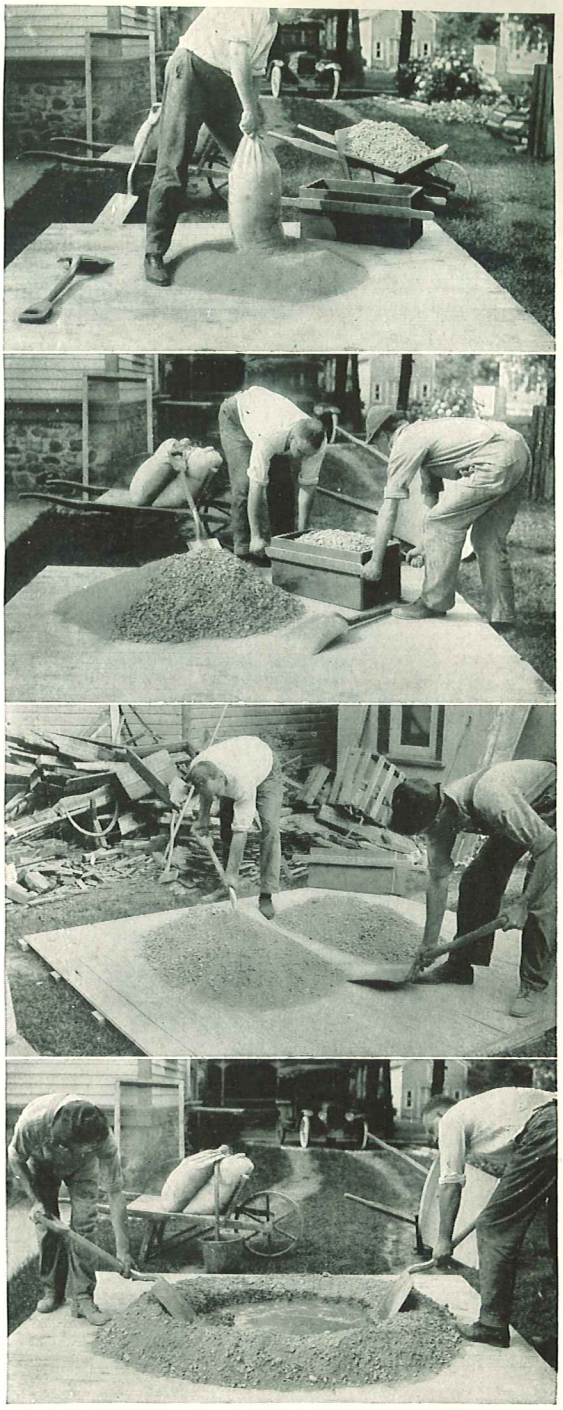
Mixing the Concrete

Although machine mixing is preferred, first class concrete can be mixed by hand. Whichever way is used, mixing should continue until every pebble is completely coated with a thoroughly mixed mortar of cement and sand.

If a tight floor is not available for mixing concrete a watertight mixing platform should be made. It should be large enough for two men using shovels to work upon at one time. Seven feet wide and 12 feet long is a good size. This platform is preferably made of matched lumber so that the joints will be tight. Strips are nailed along three sides to prevent materials from being pushed off in mixing.

The measured quantity of sand is spread out evenly on the platform and on this the required amount of cement is evenly distributed. The cement and sand are turned with square pointed shovels to produce a mass of uniform color, free from streaks of brown and gray. Such streaks indicate that cement and sand are not thoroughly mixed. The required amount of coarse aggregate is then measured and spread in a layer on top of the cement-sand mixture. Mixing is continued until the pebbles have been uniformly distributed throughout the mass. A depression or hollow is then formed in the middle of the pile and the correct amount of water added while the materials are turned. This mixing is continued until the cement, sand and pebbles have been thoroughly and uniformly combined.

The concrete should be placed in the forms within 30 minutes after mixing. It should be well tamped or spaded as it goes into the forms. This operation forces the coarse aggregate back from the face making a dense concrete with smooth surfaces.



Steps in the work of mixing concrete by hand. Thorough mixing and accurate control of water are essential for satisfactory results.

Curing

Do not permit the newly placed concrete to dry out. Protect it from the sun or drying winds for a week or ten days, otherwise the water necessary for proper hardening will evaporate resulting in loss of strength. Floors, walks and similar surfaces can be protected by covering with earth or straw kept moist by occasional sprinkling as soon as the concrete has hardened sufficiently so that it will not be injured.

Walls and other sections which cannot be conveniently covered by this method can be protected by hanging moist canvas or burlap over them and wetting down the work frequently for ten days or so after placing. In cold weather work should be protected but need not be kept moist.

Reinforcement

Reinforcement is the term used to describe the steel rods or mesh that are placed in the concrete to increase its strength where subjected to forces tending to bend or pull it apart. Care should be taken to place the reinforcement in correct position and in the part of the concrete mass where it will be most effective.

HOW TO FIGURE QUANTITIES

QUANTITIES OF CEMENT, FINE AGGREGATE AND COARSE AGGREGATE REQUIRED FOR ONE CUBIC YARD OF COMPACT MORTAR OR CONCRETE

MIXTURES			QUANTITIES OF MATERIALS				
Cement	F. A. (Sand)	C. A. (Gravel or Stone)	Cement in Sacks	Fine Aggregate		Coarse Aggregate	
				Cu. Ft.	Cu. Yd.	Cu. Ft.	Cu. Yd.
1	1.5	...	15.5	23.2	0 86	....	....
1	2.0	...	12.8	25.6	0 95	....	....
1	2.5	...	11.0	27.5	1 02	....	....
1	3.0	...	9.6	28.8	1.07	....	....
1	1.5	3	7.6	11.4	0.42	22.8	0.85
1	2.0	2	8.3	16.6	0.61	16.6	0.61
1	2.0	3	7.0	14.0	0.52	21.0	0.78
1	2.0	4	6.0	12.0	0.44	24.0	0.89
1	2.5	3.5	5.9	14.7	0.54	20.6	0.76
1	2.5	4	5.6	14.0	0.52	22.4	0.83
1	2.5	5	5.0	12.5	0.46	25.0	0.92
1	3.0	5	4.6	13.8	0.51	23.0	0.85

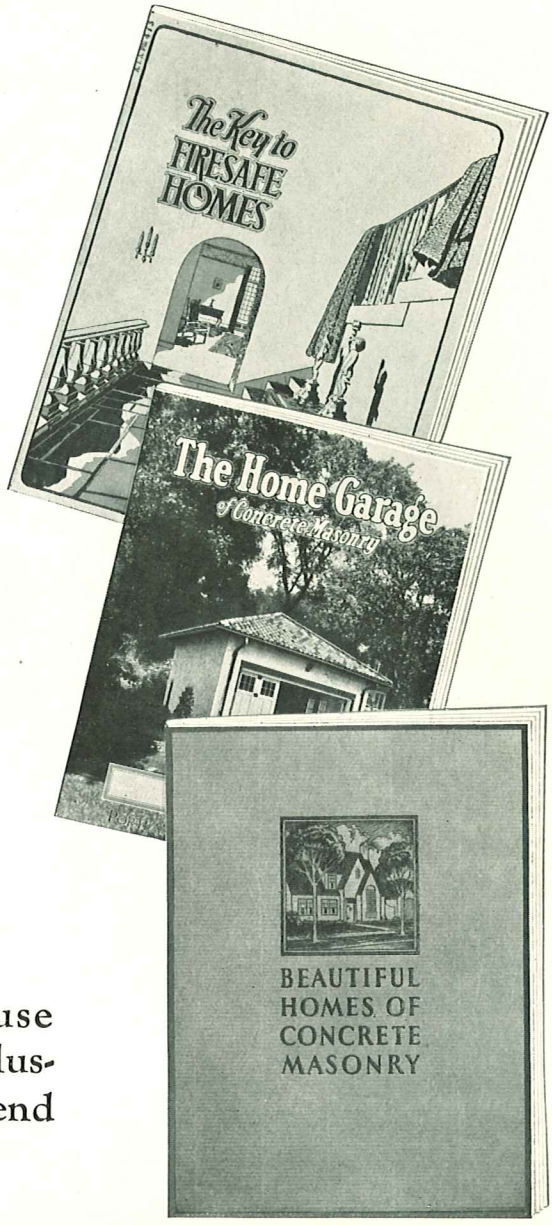
1 sack cement = 1 cu. ft.; 4 sacks = 1 bbl. Based on tables in "Concrete, Plain and Reinforced," by Taylor and Thompson.

MATERIALS REQUIRED FOR 100 SQ. FT. OF SURFACE FOR VARYING THICKNESSES OF CONCRETE OR MORTAR

C. = Cement in Sacks.
F.A. = Fine Aggregate (Sand) in Cu. Ft.
C.A. = Coarse Aggregate (Pebbles or Broken Stone) in Cu. Ft.
Quantities may vary 10 per cent either way depending upon character of aggregate used. No allowance made in table for waste.

Proportion	1 - 1½			1 - 2			1 - 2½			1 - 3		
Thickness in Inches	C.	F.A.	C.A.	C.	F.A.	C.A.	C.	F.A.	C.A.	C.	F.A.	C.A.
⅜	1.8	2.7		1.5	3.0		1.3	3.2		1.1	3.4	
½	2.4	3.6		2.0	4.0		1.7	4.3		1.5	4.4	
¾	3.6	5.4		3.0	6.0		2.5	6.3		2.2	6.8	
1	4.8	7.2		4.0	7.9		3.4	8.4		3.0	8.9	
1¼	6.0	9.0		4.9	9.9		4.2	10.5		3.7	11.1	
1½	7.2	10.8		5.9	11.9		5.1	12.7		4.4	13.3	
1¾	8.4	12.6		6.9	13.9		5.9	14.7		5.2	15.7	
2	9.6	14.4		7.9	15.8		6.8	16.9		5.9	17.7	
	1 - 2 - 2			1 - 2 - 3			1 - 2½ - 3½			1 - 3 - 5		
3	7.7	15.4	15.4	6.5	13.0	19.3	5.5	13.6	19.1	4.3	12.8	21.3
4	10.2	20.4	20.4	8.6	17.2	25.8	7.3	18.1	25.4	5.7	17.0	28.4
5	12.8	25.6	25.6	10.8	21.6	32.2	9.1	22.6	31.8	7.1	21.3	35.5
6	15.4	30.7	30.7	12.9	25.8	38.6	10.9	27.2	38.2	8.5	25.6	42.6
8	20.6	41.0	41.0	17.2	34.4	51.6	14.6	36.4	51.0	11.4	34.1	57.0
10	25.6	51.2	51.2	21.5	43.2	64.4	18.2	45.3	63.5	14.2	42.5	71.0
12	30.7	61.4	61.4	25.8	51.6	77.2	21.8	54.5	76.3	17.0	51.1	85.1

Send for These Free Booklets



Each of these booklets holds interesting information and valuable suggestions that you will want to use when you build.

Permanent, firesafe house construction is well illustrated and described. Send for your free copies.

PORTLAND CEMENT ASSOCIATION

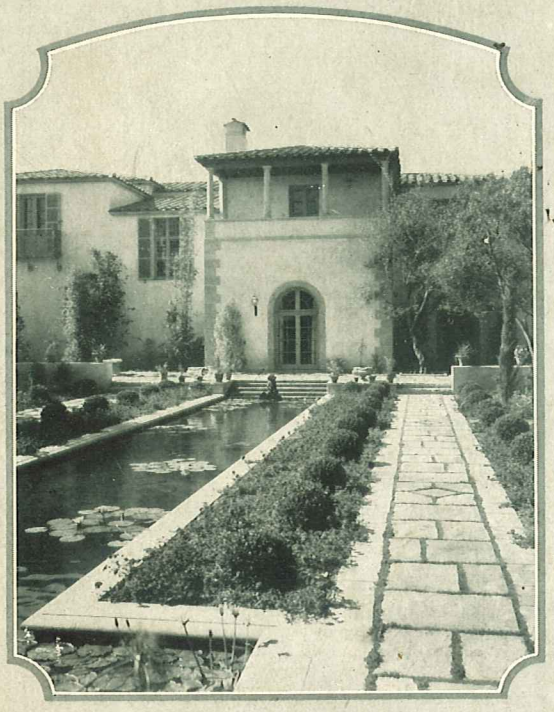
A NATIONAL ORGANIZATION TO IMPROVE AND EXTEND THE USES OF CONCRETE

33 West Grand Avenue
CHICAGO

Offices in Principal Cities

Printed in U. S. A.

F5—25M—11-30—5—48P



Concrete
for
Permanence